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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLVI. No. 3053.] LONDON, NOVEMBER 16, 1921. [73RD YEAR. PRICE 1s.

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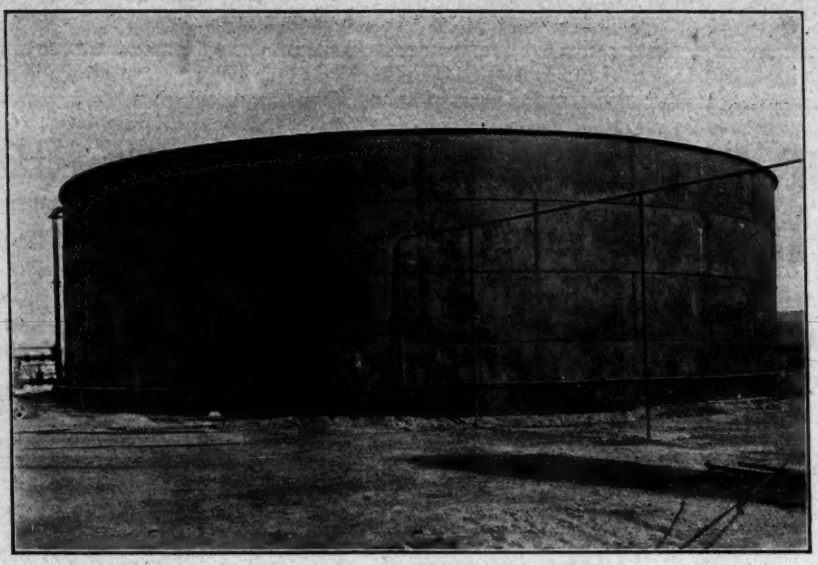

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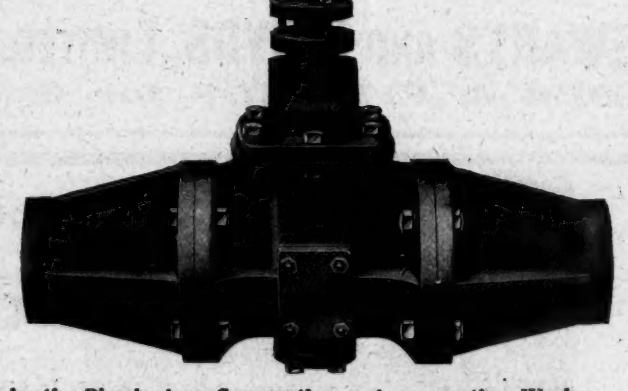

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VOL. CLVI., No. 3053.] WEDNESDAY, NOVEMBER 16, 1921. [73RD YEAR.

EDITORIAL NOTES.

A Typical Prescription by the Gas Referees.

As is now well known throughout the gas industry, the Gas Referees are not yet in a position to prescribe a recording calorimeter for official testing purposes. But the Gas Regulation Act is in operation; and the new conditions cannot wait an indefinite period for the perfecting of a recording instrument. Therefore the Gas Referees have had to design a set of prescriptions for the testing of calorific value, purity, and pressure with, for calorific value, the ordinary calorimeter as the basis of the official work in that particular. It looks as though it will be some considerable time before we may count upon a recording calorimeter being officially installed for the purposes of the Act. The industry will be quite content to wait, so that the care of the Referees may result in a certainty which is impossible at present. But the Referees have to bridge the time between now and when happily they can say that a recording instrument that will function faithfully and well for official purposes stands as another achievement to science and perseverance. In providing this bridge, prescriptions under several Orders have already been issued. Now under the Aldershot Gas Order, the Referees have framed a prescription in which a plurality of local authorities are concerned in the making of tests; but the same principles apply (with extensions) as to a case in which there is only a single testing authority. In other words, this prescription incorporates the points contained in preceding ones, and is typical of what all other possessors of Orders under section 1 of the Gas Regulation Act may now expect will be applied to them, and in its complete form where the supply area involves several authorities, and, under previous Special Acts, more than one testing-place. We are indebted to the Referees for forwarding this example for the information of the large part of the industry that has not yet come under Orders or testing regulation in accordance with the new Act.

Naturally, there is rather more detail in respect of testing under the Act than there was formerly under Special Acts; and this, particularly where several testing authorities are concerned, may at first look like complexity. But it is obvious from the Aldershot prescription (which we publish in full, with the appendixes, so that the whole document may be available to our readers) that the Referees have made a good and successful attempt at eliminating trouble and inconvenience, and assuring that the most perfectly protective testing course for all shall be pursued under the imperfect condition existing of there being at present no recording calorimeter *in esse* with which to complete the intentions of the Act. But what may on first reading appear a little complex will, we think, on second reading become less so; and ultimately the rules will be seen to have been indited with an eye to clearness and simplicity; and the obligations imposed will, with their observance by the gas examiners and all concerned, in a short time become as routine as those in pre-existing circumstances. It will be seen that the Referees, where there are several stations, are not harassing those responsible for their equipment to have more than one brought to a state of workable completeness at once; but the dates by which the remaining stations are to be in operative state are specified. Beyond this, it is sufficient to indicate that the laying and marking of service-pipes to the stations are the subjects of prescription; and so is the apparatus to be installed. Instructions to the gas examiners are given explicitly in the prescription. The frequency of the tests for calorific power is specified; and how the average is to be computed is explained. Where there is more than one testing-station, the average of the whole of the results during a quarter from the various stations is to be calculated, and the result will be the calorific value for the quarter. The gas suppliers are to exhibit the quarterly reports in all their offices and showrooms; and each collector of accounts is to be furnished with a copy to be produced to any consumer on demand. Notification that this is done is to be made in specified form on every gas account. Gas suppliers as well as the examiners will find their obligations duly set forth in the prescription, and will read, mark, and learn so as not to run into default through negligence.

Sir George Beilby and his Staff Reply.

IN time for publication in this week's "JOURNAL," but not for any extended comment, is the reply which Sir George Beilby and members of his staff—Dr. C. M. Lander, Commander J. Fraser Shaw, and Mr. J. G. King—have made to the discussion, at the meeting of the Institution of Gas Engineers, on the paper describing the valuable work done at the Fuel Research Station regarding the steaming of charges in vertical retorts. Sir George is highly gratified with the reception and consideration given to the report on the work, which reception and consideration are an expression of the appreciation of the technical men of the industry. It would, indeed, have ill-become the gas industry if its technical men had not appraised the work at the high value which it deserves, as a classical contribution to the technology of coal carbonization. The reply that is now made to the discussion is a studied one; and those who were critics—particularly Dr. Parker, Mr. Thomas Glover, Mr. Thomas Hardie, and Prof. Cobb—will find their submissions dealt with in detail. Their criticisms have drawn-out explanation and elucidation which form a valuable addendum to the original report. The points are many. From them, two very practical lessons which the report brought into prominence—one for the first time, the other in confirmation of prior practical experience—may be emphasized in this brief reference. The first is the reduction of the total heat used in carbonizing in vertical retorts when employing steam. The explanation of this is that the heat in the incandescent coke at the bottom of the retort is made use of in producing the water gas, while the sensible heat of the water gas generated at the bottom of the retort conveys the heat up through the coal, and assists in the distillation of the coal in the upper part of the retort. As a matter of fact, the reply tells us that the investigators at the Fuel Research Station have come to the conclusion that they cannot afford to carry on the work of carbonizing in vertical retorts at the temperatures employed without steaming, owing to the base of the retorts becoming red hot, and the metal work in the vicinity getting damaged. The second point is the repetition of the fact, brought out in the discussion by Mr. Thomas Hardie, that Durham coal has proved perfectly satisfactory so far as its passage through vertical retorts is concerned. Those gas engineers who have declared the contrary is their experience must look for some cause in their own methods of operation to account for the opposite experience. A useful part of the reply will be found in the illustration (when dealing with Mr. Thomas Glover's remarks) of how to use the graphs which accompanied the paper. All technically concerned in the production of town gas will be pleased to see the statement of Sir George that, as regards the work of the immediate future, it is believed that he and his staff will best meet the needs of the gas industry by extending their observations to fresh types of coal from different localities. Arrangements to this

end are at present being made. The gas industry will welcome this information, and will await the results with considerable interest.

Is the Gas Companies' Protection Association Now Necessary?

For nearly twenty-five years the Gas Companies' Protection Association have rendered good service to gas companies particularly, and to the whole industry generally. The Association have become specialists, so to speak, in looking after the interests of gas companies at Westminster. The record of the work of the organization is one upon which the members and the active spirits in it may look with pride. Not the least of its good works is that it was the means of bringing to the aid of the industry the brilliant, convincing, and indisputable evidence that Dr. Carpenter submitted to the two Departmental Committees respectively dealing with incombustibles in gas and with carbon monoxide. Some features of the record of work were given by Dr. Carpenter, as Chairman of the Committee of the Association, at the meeting on Wednesday last; and we urge every responsible man identified with gas company enterprise to read the report of that speech, and then to decide, if his undertaking is not already included in the membership, whether or not it is desirable that it should be. The question is one which must be answered by gas companies themselves; and it is a matter for their very serious consideration.

There are many gas companies who regard the Association as being in a moribund condition or unnecessary. The state of the finances at any rate, if the Association is considered to be an essential (and Dr. Carpenter and others in the membership hold that it is), is anything but creditable to the gas company administered part of the industry; and the remuneration of the Secretary for his services, the use of his offices, clerical staff, &c., cannot be regarded as of an order upon which the subscribing companies can look with satisfaction. Year after year Mr. H. E. Jones, as the former occupant of the chair of the organization, has appealed for a lengthening of the roll of membership, and so an increase in the financial support. But the appeal has either fallen upon deaf ears, or the argument has not been sufficiently persuasive or convincing to bring about the desired result. And now Dr. Carpenter appeals, and states the reasons why gas companies should keep an organization of their own alive, and in an effective condition. He frankly admits that a large proportion of gas companies are not members of the organization; and this appears to indicate that the judgment of a large proportion of gas companies, if they have really considered the matter, does not run altogether parallel with that of those who are actively interested in the Association. We cannot find any other reason for the judgment than that the industry, including gas companies, is regarded as being adequately protected by the larger organization that has come into being. But on the other hand—and this we wish to emphasize strongly in order that it may receive due deliberation—some of the most important gas companies in the kingdom are included not only in the membership of the Association, but in that of the National Gas Council; and Dr. Carpenter made the point very clear in more than one part of his speech that there are matters upon which the industry—company and local authority gas undertakings—must speak with a united voice. But he does not think this should for a single moment interfere with the raising of the voices of gas companies in respect of matters upon which they desire to be specially heard on behalf of those who have invested money in joint-stock gas enterprise. The municipalities, of course, might say much the same thing regarding their own position; and yet Dr. Carpenter himself admits that there are matters upon which the whole industry must speak with one voice. That the Association cannot do this owing to its constitution has been a disability; and in cases a disadvantage. It is equally clear that circumstances might arise—such as action on electrical matters—in which a body representing both company and municipal gas undertakings could not operate without creating a cleavage.

The main contention of Dr. Carpenter in favour of an *ad hoc* body for the protection of gas companies' special interests is based upon the ground of invested capital by private individuals. Roundly, there is a sum of about 102 millions invested in statutory gas company undertakings in the United Kingdom. This is an immense sum; and it represents the investments of a large number of people. The investment is held to be the particular care, and it receives the close watchfulness, of the Association. On this circumstance alone, without any others, it is submitted that the Association should not only be preserved but strengthened. Such an amount of capital is a matter of considerable responsibility; but it must be admitted that there was not a single organization in the Kingdom that was capable of effectively protecting the capital during the war. It was not the fault of the organizations. They tried hard to obtain justice. The forces against them, however, were then too strong. But since the war there has been constructive amendment through the Gas Regulation Act. In this connection we should like to say that we have never in recent years found municipal authorities with gas undertakings refusing to throw their weight into the balance in defence of the investments of joint-stock gas enterprise. Some of them confessedly have shown, owing to the character of their constitution, certain weaknesses, particularly in one direction. But we have the admission of Dr. Carpenter that even labour is now realizing more and more that upon the proper use of capital depends largely national prosperity, and therefore employment. The question for decision then is whether a body, comprising both municipal and company undertakings, can effectively look after the security of the interests and investments of company gas enterprise, or whether the Gas Companies' Protection Association should be strengthened in numbers and financial support for this particular function, while maintaining in existence the larger organization for those matters in which united action for the whole industry is necessary.

We will not say more on this occasion, because the matter as raised by Dr. Carpenter is clearly one for the judgment generally of joint-stock gas enterprise. The condition of the Association to-day reveals anything but unanimity on the question. Dr. Carpenter's appeal and argument may stimulate interest in and support for the organization. If now more members are obtained, and if increased financial support is forthcoming, the verdict of the company gas undertakings will be plain. If the Chairman has to continue to make appeals for more members and for more financial support, the verdict will be equally plain. The matter is wholly in the hands of the gas companies; and it is for them to settle it one way or the other. The Association could, of course, continue to exist with only its present membership, provided higher contributions were made. But limited membership must curtail both strength and influence, however good the work of the past, however strong the leadership as represented by the Chairman and the Committee. Once more we urge those responsible for the administration of gas companies to read Dr. Carpenter's speech, and then, if not already members, to decide upon attachment or continued detachment. To them must be left the answer to the question at the head of this article.

Progress of Carbonizing Ideals.

Judging from the flow of papers on the subject of continuous vertical retorts and steaming, and the uniform satisfaction that one finds on the part of the authors, it can only be deduced from the very occasional complaints one now hears privately—a matter with which we were dealing recently [p. 297]—as to the sticking of charges and other troubles, that the fault is not so much with the plant as the methods of working in respect of the relation of temperature to throughput. A paper which freely discussed the system, as represented by an installation of Woodall-Duckham retorts, is that of Mr. F. Davies, the Assistant Gas Engineer at Walsall, to the Midland Junior Association. But we venture to say the secret of the satisfaction that he and his chief (Mr. B. W. Smith) have over the working of the installation is to be found in the regularity, cleanliness, and control which prevail as practices in the working of the plant. But it all pays in result and smoothness of operations. Hence, at the present time, we have Mr. Davies referring to coal distillation as carried out in continuous vertical retorts as being generally recognized as the "ideal" one. Conceptions and acceptances of the ideal in anything change with time and development. Once upon a time the mechanical stoking of simple settings of horizontals was the "ideal" system; and when we got to regenerative horizontal settings and the more advanced methods of mechanical operation, then it was *ne plus ultra*. But now we have a fresh "ideal" system in continuous vertical retorts; and

other processes are coming forward to contest the claim. However, we do not mind one ideal being thrown from its pedestal, so long as the one which replaces it brings us something economically better.

At one time in the Walsall house where the twenty vertical retorts now stand, each capable of carbonizing 5 tons of coal per day, there were direct-fired retorts; then regenerative settings displaced them. We remember seeing them when new. These gave the house a productive output of 1½ million cubic feet per day. Now the continuous verticals only occupy part of the house, and, without steaming, they produce 1¼ million cubic feet a day; with steaming, 1¾ million cubic feet of 450 B.Th.U. gas, or on the cubic feet basis ¼ million in excess of the whole house before. In the event of the entire house being converted to the vertical system with steaming, it would have a productive capacity per day of 5 million cubic feet, which, calculated on a 450 B.Th.U. basis, would mean 22,500 therms, as compared with (assuming a 520 B.Th.U. basis) 7800 therms with the displaced regenerative settings. The present installation of twenty retorts will yield 7875 therms per day. We are not prepared to prophesy definitely; but we shall look forward to the subversion of the present ideal. Upon the same ground, or near by, we may yet see a system making gas by internal heating and complete gasification, which will still further enhance the make from the same ground space —especially if steam and oxygen are used, to avoid the thermal waste of the air-blow period.

Just a word as to coke, tar, and sulphate. The coke used in steaming the vertical retorts at Walsall is 1¼ cwt. per ton of coal carbonized; and in the producer fires, 2½ cwt. The amount of coke dust made is ¼ cwt.; and there are available for sale 9 cwt. of coke. The author speaks very highly of the heating arrangements in the setting. The yield of tar averages 14·9 gallons per ton of coal; and 31·7 lbs. of sulphate of ammonia are made. The story is a good practical one; and patently a large amount of the experience is due to that first principle in gas-works management to-day—systematic control.

Grants for Gas and Electricity Works.

THE schemes of the Government for financial facilities to aid in ameliorating the hardships of the present widespread unemployment look as though they may work unfairly as between (where in competition) municipal trading enterprise in electricity and joint-stock enterprise in gas; and even the best of care on the part of our central organizations may not be able to prevent an injustice emanating from a well-meant and benevolent effort. The National Gas Council have been in communication with the Unemployment Grants Committee, the Prime Minister, and other members of the Cabinet, in order to secure for gas companies similar grants to those that are being made to municipal undertakings. The Grants Committee state that they have no power to extend such grants in the manner suggested. Then there is the Trades Facilities Act—a measure that received the Royal Assent on Thursday last. The Council consider that this will not prove of any material service to the gas industry. But, on the other hand, the Gas Companies' Protection Association have circularized their members on the subject, and are investigating the replies in order to ascertain whether there are sufficient grounds upon which they can proceed to obtain financial facilities under the Act to render some help in the alleviating of unemployment, and at the same time do something in the interests of gas company undertakings. If municipal electricity supply undertakings are to have in the present time superior money facilities to gas companies with whom they are in competition for business, this will be distinctly unjust. There is quite a feverish movement in the municipal part of the electricity industry to secure money on the terms laid down by the Government for the purpose of creating employment, but looked upon by electricity departments as an opportunity not to be missed in their own interests. We see schemes already on paper to extend electricity distribution systems into subsidiary thoroughfares, and for the conversion of street-lamps from gas lighting to electricity without any advantage to the public. This is a matter referred to to-day in our "Electricity Supply Memoranda." In some cases it seems pretty obvious that these extensions will have a bad effect on the financial position of the undertakings concerned, and so probably in some cases upon the ratepayers. As large ratepayers, this is a matter over which gas companies must keep vigilant watch. The National Gas Council ask that District Executive Boards should keep a careful eye upon the position, and report to headquarters immediately any proposals are made, so that the interests of the gas industry may be protected.

The Miners and the Unexpended Balance.

THE Miners' Federation appear to have played their last card in trying to secure the unexpended balance of 3 millions of the sum of 10 millions which was voted as the maximum subvention for a limited period to help the miners during the time the coal industry was struggling to extricate itself from the mess into which the Miners' Federation and their followers had pushed it by their policy of error and folly. Never has any body of workers received so much consideration from the country, and yet never has any body of workers inflicted so much harm upon the country and every individual in it. How long they expect consideration of a privileged character, we do not know; but the attempt has been made to relieve the men in the coal districts where the heaviest cuts in wages have been made under the agreement, and where unemployment and short-time work is most acute. The Miners' Federation have interviewed the Premier, without success. They have also been interviewing Members of Parliament, but without success. The 3 millions remain in the Treasury. The miners are in large part the authors of their present position, and of the position of a considerable number of that 1¾ millions of men and women who are now out of work, and more still who are working on short time, in other industries. But no organization representing those workers in other industries has gone to the Premier or to Parliament, and asked for a special subsidy for themselves of 3 millions, much less 3 millions upon 7 millions already expended. We have seen examples of colossal impudence before; but in view of the widespread unemployment and short-time working in other industries, this attempt to get hold of the 3 millions for the miners alone (which 3 millions would have to be in considerable part found by other industries) must be awarded premier place in that particular category of human actions. In his speech when proroguing Parliament, the King referred to the coal strike as "the most serious industrial conflict "which has ever menaced the prosperity of the realm. ". . . . The dispute unhappily aggravated the adverse "effect of the sudden world-wide trade depression." The Government are doing their best to relieve unemployment caused by the trade depression "aggravated" by the miners' strike; but the Miners' Federation apparently want that 3 millions as a sort of special gratuity to the miners for the results of their destructive behaviour. We repeat what we and others have said before, that the most practical way in which the miners can operate to better the condition of employment in the coal areas is to work with the owners in improving production per unit of cost, so as to build-up demand again by charging lower prices. That is the way of salvation for the coal industry. While subsidies intervene that way will not be trodden—by the miners.

Housing and Gas-Mains.

On the question of gas in housing schemes, the British Commercial Gas Association are the industry's guides, philosophers, and friends. One of the Association's friendly or protective actions has been to assist in setting right a little misunderstanding which would not have occurred had there been recognition of the fact that besides the Association of Municipal Corporations there exist central organizations possessing authority to confer and to present cases respecting matters that affect the gas industry. The gas industry is made up of not only companies but municipal authorities. It seems that an agreement was entered into between the Association of Municipal Corporations and the Ministry of Health as to the terms on which gas-mains should be laid to housing estates; but, singularly, the terms were not submitted to, or approved by, municipal gas departments. When they came to their knowledge, they found them unfavourable and quite unacceptable. Representatives of the gas departments thereupon had a conference on the subject with the Law Committee of the Municipal Association, who have since addressed a letter to the Ministry of Health redrawing their proposals so far as they relate to gas. The terms of the letter will be found in the minutes of the Executive Committee of the British Com-

mercial Gas Association published in later columns. The upshot is that municipal gas departments will be free to negotiate with housing authorities, according to their local circumstances.

The Gas Coal Position.

From most of the coal areas, there come reports of an improvement in the demand for gas coal, accompanied naturally by a better inquiry for the household varieties. This is attributed not only to the shorter days, but to the colder weather. It is true that in many gas-supply areas the domestic consumption of gas has been largely increased in contrast with the demand only a few weeks ago when the people were basking in sunshine. But in certain areas, this accretion of consumption is largely set-off by the relatively small industrial demand compared with what it is normally at this period of the year. The Yorkshire area reflects very largely the reports coming from most of the other coal districts as to the increase of demand. We must, however, except Northumberland and Durham, where, in respect of gas coals, the colliery owners are still living in expectation of better times. The colder weather notwithstanding, the inquiry for gas coals there has only slightly improved; and this relates more particularly to coal for export. However, the colliery owners are looking forward to receiving greater demands from Continental sources. A feature, speaking generally of the coal areas, is that there is a stronger inquiry from the gas industry for the best grades of gas coal. Of course, the best grades are oftentimes the cheapest for transit, and gas production, and coke quality. On the other hand, while the demand for the better grades has stiffened in most classes of coal, smalls and slacks still give a great deal of trouble by their accumulation.

Work of the Director of Gas Administration.

The captious criticisms that have been made in a few places, and which led to a question in the House, as to the so-called delay of the Board of Trade in dealing with applications under section 1 of the Gas Regulation Act do not, as we have said more than once, represent the views of the industry generally. The industry knows very well that such a drastic change as has been made, with all the detailed work that it involved, could not be dealt with in any off-hand manner. The genuine view of the greater part of the industry as to the work that has been accomplished was voiced by Dr. Carpenter at the meeting of the Gas Companies' Protection Association last Wednesday. As Chairman of the Association, he referred to the great satisfaction of the members over the admirable manner in which the Director of Gas Administration has carried out his very arduous and very difficult task. He has got through an enormous amount of work; and this is due entirely to the earnestness with which he has applied himself to it. These views were heartily endorsed by the members; and they, as representing gas undertakings, are in a position to judge.

Ten Years' Service.

From the beginning of the British Commercial Gas Association, Mr. F. W. Goodenough has been Chairman of the Executive Committee, and much more; and this without fee or reward other than the appreciation of the gas industry. Ten years' work of this concentrated and voluntary kind is a big gift to the industry, which cannot possibly be repaid. Spontaneously, the General Committee felt that, at the conclusion of the ten years, they could ask Mr. Goodenough's acceptance of a present which would give material form to the heartfelt acknowledgments that have frequently been made to him. The presentation took place last Tuesday week; and what was said on the occasion is fully reported in later columns.

The After-Contraction Test.

At the request of Mr. A. E. Broadberry, M.Inst.C.E., Chairman of the Joint Refractory Materials Committee of the Institution of Gas Engineers and the Society of British Gas Industries, we publish to-day a report on "The Standardization of the After-Contraction Test," by Miss D. A. Jones, B.Sc. Mr. Broadberry desires us to say that the suggested new method of measurement of expansion and contraction needs thorough trial before being adopted. The contradictory results may be found to emanate from the more complete soaking of the smaller pieces as compared with the whole brick. The most important feature of all the tests is that they all come within the present specification, and therefore in themselves do not seem to call for a revision of the specification so much as an improved method of the prescribed test.

Gas and Smoke.

That gas is the most promising fuel for dealing with the smoke nuisance is the lesson of a critical survey of the fuel position made by Prof. Cobb in the current issue of the "Edinburgh Review." A bird's-eye view of the article is presented in later columns of to-day's "JOURNAL." The progress of gas in this matter will depend largely on the relation that the price of the heat unit in gas bears to that of the heat unit in coal; but it must always be remembered that the former heat unit can be used twice to three times as efficiently as the latter.

PERSONAL.

We have pleasure in announcing that the Right Hon. Lord RIDDELL OF WALTON HEATH has accepted the Presidency of the Society of British Gas Industries.

The marriage of Mr. J. L. BENNET, Director of Messrs. Alder and Mackay, Ltd., to Miss Winnie Samson, took place at Edinburgh on the 3rd inst. Mr. Bennet is the eldest son of the late Mr. J. H. Bennet, Managing-Director of the Company; and as a Lieutenant in the R.G.A. he was badly wounded on the Italian Front.

The election by the official staff of an Employees' Director of the South Metropolitan Gas Company, to fill the vacancy caused by the retirement of Mr. J. Waterer, who had been a member of the Board since 1912, resulted in the return of Mr. PHILIP RICHBELL, Chief Cashier, who is one of the representatives of the staff on the Co-Partnership Committee.

The Gas Department of Airdrie—and, indeed, the town as a whole—have sustained a considerable loss by the retirement of Baille JAMES GOLDIE, J.P., from the Convenership of the Gas Committee and from municipal life generally. He has had fifteen years' connection with the Gas Department, and for thirteen years was Convener. His practical qualification for the post consisted in his long experience of the working of a private gas installation in connection with the extensive mills of his firm—an experience which he turned to good account. During his Convenership, the works have been almost entirely modernized and brought up-to-date; while the distribution system has been renewed and enlarged to keep pace with the growing demands for gas. In the past year, under Bailie Goldie's guidance, the Council passed an order for a carburetted water-gas plant, which is now being fitted up under the supervision of Mr. Arch. Kellock, the Engineer and Manager. Since Bailie Goldie entered the Council in 1906, there has been an increase in the annual make of gas from 72 to 134 million c.ft. Ex-Bailie MARTYN, the new Convener, has since 1914 taken a keen interest in the development of the gas undertaking.

Mr. W. T. BUCKLAND has just retired after 43 years' service as Gas-Works Manager under the Chesterfield (Derbyshire) Corporation. Under his direction, the gas undertaking has made much progress. A native of Sutton-in-Ashfield (Notts), he served an apprenticeship to a firm of gas-fitters, and in 1878 started as a meter inspector at the Chesterfield Gas-Works, then owned privately and under the management of Mr. C. E. Jones. Afterwards, Mr. Buckland became yard foreman, and subsequently entered the office of Mr. Jones, where he proved so useful that he was soon appointed Assistant Manager. On the retirement of Mr. Jones in 1896, he was chosen Manager. At that time the works, which had been taken over by the Chesterfield Gas and Water Board, comprised only one retort-house, with fifteen beds of retorts, 9 ft. long, capable of a total production of about 350,000 c.ft. a day; while the purifiers, station meter, &c., were on the site occupied by the present offices. There were two gasholders with a storage capacity of about 420,000 c.ft. In November, 1898, a scheme for structural alterations of the retort-house was carried out, and six beds of seven inclined retorts 20 ft. long were erected, and a new Livesey washer and new purifiers were introduced. Then in 1901 the storage capacity of the works was increased by the erection of a three-lift holder; and in 1903 the inclined retort-bench plant was doubled and a spiral-guided gasholder was also erected with a capacity of about 600,000 c.ft.—bringing the total storage capacity of the works up to one million. When Mr. Buckland started with the old Chesterfield Gas Company, the annual production was 42 millions, and the consumers numbered 3697. At the present time, the yearly production of gas is about 250 millions, and the number of consumers is 15,783. Mr. Buckland will still be connected with the undertaking as Consulting Engineer. He is succeeded as Manager by Mr. H. DAVIES.

Mr. John Forshaw, Deputy-Chairman of the Preston Gas Company, who died last June at the age of 83, left estate of the gross value of £40,956, with net personalty of £18,016.

THE PROVISIONAL PRESCRIPTION OF THE GAS REFEREES.

UNDER THE GAS REGULATION ACT, 1920.

THE Gas Referees have sent, for information as to the principles which guide them in making their prescriptions, a copy of the provisional prescription which has recently been issued by them for the Aldershot Gas, Water, and District Lighting Company. Similar provisional prescriptions have been issued earlier for certain other gas undertakings; but the Aldershot prescription embodies all the points of the earlier provisional prescriptions, and indicates the general method in which the Referees propose to deal with an undertaking supplying the districts of several local authorities, and having more than one testing-place prescribed.

ALDERSHOT GAS (CHARGES) ORDER, 1921.

PROVISIONAL PRESCRIPTION OF THE GAS REFEREES ISSUED NOVEMBER, 1921.

Office of the Gas Referees,
66, *Victoria Street, S.W.* 1.

WHEREAS the undersigned have been appointed Gas Referees under Section 4 (1) of the Gas Regulation Act, 1920.

AND WHEREAS it is the duty of the said Gas Referees under Section 5 (1) of that Act to prescribe (*a*) the places and times at which, and the apparatus and method by which, tests shall be made to ascertain whether any gas undertakers with respect to whom an Order has been made under the Act are supplying gas in accordance with their obligations; and (*b*) the method by which any such apparatus shall be verified; and (*c*) the time and form of the reports to be made by the gas examiner to the Gas Referees and the local authority or quarter sessions by whom he is appointed, and to the undertakers, and the means by which the results of the tests shall be made available to the public, and under Section 9 (4) of the Act to prescribe the manner in which the average calorific value of the gas for the quarter shall be ascertained.

AND WHEREAS an Order under Section 1 of the Gas Regulation Act, 1920, has been made by the Board of Trade on March 30, 1921, with respect to the Aldershot Gas, Water, and District Lighting Company.

AND WHEREAS the said Company has given notice in the "London Gazette," dated April 1, 1921, that it intends to supply gas of a calorific value of 450 B.Th.U. (gross) per cubic foot as from April 1, 1921, and of 500 B.Th.U. (gross) per cubic foot as from July 1, 1921.

NOW THEREFORE, in compliance with the provisions of the said Act, the said Gas Referees do hereby prescribe as follows in regard to the gas supplied by the Aldershot Gas, Water, and District Lighting Company, hereinafter called "the Gas Company:"

The places at which testings of calorific value, pressure, and purity in respect of freedom from sulphuretted hydrogen shall be made are (*a*) at the Ash Road Gas-Works, Aldershot, being a testing-place provided under the Aldershot Gas and Water Act, 1866; (*b*) at the North Camp and Farnborough Gas-Works, being a testing-place provided under the North Camp and Farnborough District Gas Order, 1877; and (*c*) at the Municipal Buildings, Aldershot, being a testing-place provided under the Aldershot Gas and Water Act, 1901.

If any one of these testing-places shall not be deemed to be a prescribed testing-place under section 5 (1) of the Gas Regulation Act, 1920, the Gas Referees hereby prescribe that it and every one of these three testing-places shall be testing-places prescribed by them under section 5 (1) (*a*) of the Act at which tests should be made to ascertain whether the Gas Company is supplying gas in accordance with its obligations.

All three testing-places shall be maintained, and the apparatus herein prescribed shall be provided and maintained by the said Gas Company to the satisfaction of the Gas Referees. The Gas Company shall at all times immediately give free access to the Ash Road and North Camp and Farnborough testing-places to a Gas Examiner or Gas Examiners duly appointed under the Gas Regulation Act, 1920, to test the gas supplied by the Company, by either the Aldershot Urban District Council, the Farnborough Urban District Council, the Frimley Urban District Council, the County Council of the County of Southampton, or the County Council of Surrey, or by any or all of the said local authorities (or by quarter sessions for the district of any or either of these authorities).

The Gas Company shall by Nov. 16, 1921, give facilities to the Gas Examiner for testing at Ash Road with the non-recording portion of the Simmance calorimeter or with the Boys calorimeter. They shall similarly give facilities for testing by means of the Boys calorimeter not later than Jan. 1, 1922, at the Municipal Buildings, and not later than April 1, 1922, at the North Camp and Farnborough testing-place.

The service-pipes to the testing apparatus in the testing-places shall be laid and connected by the said Gas Company as follows:

At the Ash Road testing-place, two connections after the outlet of the town governors, one on the 18-in. main supplying gas to Aldershot town and other districts, and the second on the 14-in. main supplying Farnborough gasholder station, the district of the Surrey County Council, and other districts. The service-pipes laid from the two said connections shall be arranged within the testing-place so that the gas may be tested from either main upon the same calorimeter, and the service-pipe shall be legibly marked "Aldershot and District" or "Farnborough and Surrey Districts" as the case may be. Testings for the district of the Urban District Council of Aldershot shall be made by means of the "Aldershot and District" service, and testings for the districts of the Farnborough, Frimley, and Fleet Urban District Councils and of the County Councils of Surrey and of the County of Southampton shall be made by means of the "Farnborough and Surrey Districts" service.

At the Municipal Buildings testing-place, the connection shall be made upon the largest street main if more then one main shall pass the testing-place. Testings shall be made here for the district of the Urban District Council of Aldershot.

At the North Camp and Farnborough testing-place, the connection shall be made after the outlet of the town governor, upon the largest supply main leaving the works for the district. Testings shall be made here for the districts of the Urban District Councils of Farnborough, Frimley, Fleet, and of the County Council of the County of Southampton.

The four service-pipes shall be connected to the mains as described, and to no other main or source of gas supply. These service-pipes shall be laid without tap, branch, or connection of any kind between the main specified and the main tap controlling the testing apparatus.

Testings of calorific value, purity in respect of freedom from sulphuretted hydrogen, and of pressure, shall be made by the Gas Examiner at the testing-places prescribed as aforesaid—namely, at the Municipal Buildings on six days in each quarter of the year, at Ash Road on three days (or four as a maximum), and at Farnborough on three days—the intervals between consecutive testings being not more than fourteen days. At least one but not more than two testings in each quarter shall be made on a Sunday. The testings may be made at any hour, except that not more than two testings in each quarter may (but need not) be made between the hours of midnight and six o'clock in the morning.

The testings shall all be made at Ash Road on the gas supplied from either service-pipe until the testing-place at the Municipal Buildings is ready, when the tests shall be taken alternately at Ash Road on the gas supplied from the Farnborough and Districts service-pipe, and at the Municipal Buildings. As soon as the third testing-place is ready, the times and places prescribed above shall be observed.

In the event of separate gas examiners being appointed by the County Councils of the County of Southampton or of Surrey, one additional testing in each quarter shall be made by each of these Examiners. Each of the two latter Examiners shall at the beginning of each quarter notify the Gas Examiner for the Urban District Council of Aldershot of the approximate date on which he intends to make his testing in that quarter, and the Examiner for the Urban District Council of Aldershot shall so arrange his testings that no one of them shall fall on either of the dates chosen by an Examiner for either County Council.

The apparatus to be used in making testings of calorific value at Ash Road shall for the present be the non-recording portion of the Simmance calorimeter already provided by the Gas Company, used in conjunction with thermometers for which certificates have been issued by the Gas Referees, and a water-measuring vessel and a meter-proving measure which have their mark of certification; and the Gas Examiner shall verify that the apparatus is so certified.

Before making a testing, the gas examiner shall prove the meter by means of the meter-proving measure. If after four complete turns, the meter hand reads as much as one whole division in excess or defect of the point from which it started, the gas examiner shall adjust the water-level in the meter, and repeat the operation until the reading is within these limits. After proving the meter, he shall allow the gas to burn at the normal rate in the calorimeter for forty-five minutes before making his testing of calorific value.

In each testing, the Gas Examiner shall make two readings of the inlet water thermometer, and seven readings of the outlet water thermometer taken at uniform intervals of time while the meter hand makes two complete turns. In other respects, the printed instructions issued by the makers for the use of the calorimeter, of which a copy shall be provided in the testing-place by the Gas Company, shall generally be followed.

The apparatus to be provided for the testing of calorific value by the Gas Company and used by the Gas Examiner at the Municipal Buildings, and at Farnborough, shall be the Boys calorimeter with thermometers and measures certified as above, and shall be used generally as described in the "Notification" of the Metropolitan Gas Referees for the year 1914. But the period during which the calorimeter burners shall remain alight before the gas examiner makes his observations shall be forty-five minutes. A copy of the said "Notification" will be provided by the Gas Referees for each of the two testing-places in which the Boys calorimeter is used.

The apparatus and mode of testing for sulphuretted hydrogen at all three testing-places shall for the present be in accordance with the regulations prescribed in Parts I. and II. of Schedule "A" of the Gas-Works Clauses Act, 1871.

The apparatus for testings of pressure at all testing-places, and as specified below, shall be a U-tube pressure-gauge, containing water, of which the scale extends to the highest pressure at which gas is supplied by the Gas Company.

Additional testings of pressure may be made, if required, at places other than the testing-places prescribed as aforesaid, in accordance with regulations which will be prescribed by the Gas Referees in their "General Notification," shortly to be issued.

The gas examiner shall, before testing at the Municipal Buildings, give reasonable notice of his intention to the Gas Company, and shall on the same day or the day immediately following that on which any testing at either of the three testing-places has been made by him, make and deliver a report of the results of his testing to (1) the local authority or authorities by whom he is appointed, and (2) the Gas Company. He shall make these reports in the form of which a specimen is given in Appendix I. to this prescription. He shall file a copy of his report at the testing-place.

The gas examiner shall inform the Gas Referees at once of the result of any day's testings made by him which is 5 p.ct. or more below the declared calorific value, and also if at any time he has any reason to suspect that the results of his testings are not trustworthy, on account of any defect in the testing apparatus or otherwise.

The gas examiner for the Urban District Council of Aldershot shall, within seven days after the end of each quarter (March 31, June 30, Sept. 30, Dec. 31) furnish the Gas Referees with a list of the dates, times, results, and mean of all the tests, whether made by himself or other examiner, made during the quarter.

The average calorific value of the gas supplied by the Gas Company during any quarter shall be ascertained by taking the sum of the calorific values of the gas for each day, as determined by the results of all the official testings. This sum shall be divided by the number of days upon which the testings have been made during the quarter; and the quotient shall be the average calorific value in the districts for which the gas examiners have been severally appointed.

This average shall be ascertained by the examiner appointed by the Aldershot Urban District Council from the results filed at each testing-place. The same gas examiner shall make within fourteen days after the end of each quarter a quarterly report of the results of all testings made at all the testing-places of the gas supplied by the Gas Company, and shall sign the same and submit it for signature to any other gas examiner duly appointed for the other local authorities for testing the gas supplied by the Company. This quarterly report shall be in the form given in Appendix II. The gas examiner or examiners shall then forward the report to the Gas Referees, to the local authorities or quarter sessions by whom they are appointed, and to the Gas Company.

The Gas Company shall cause the quarterly reports to be made available for the use of the public, by exhibiting a copy at each of their offices and showrooms, and shall furnish each collector with a copy to be produced to any consumer on demand. The Company shall further cause to be printed on each gas account the following statement:

Gas Regulation Act, 1920.

The Gas Referees prescribe that the results of the tests made by each officially appointed Gas Examiner shall be made available to the public in the following manner: A copy of his report for the preceding quarter, as forwarded to the local authority by whom he is appointed, shall be exhibited by the Company in each of the Company's offices and showrooms, and shall be carried by each of the Company's collectors for production to any consumer on demand.

This prescription shall remain in force until superseded by a subsequent prescription.

(Signed) C. V. BOYS.
W. J. A. BUTTERFIELD.
J. S. HALDANE.

APPENDIX I.

Gas Regulation Act, 1920.

GAS EXAMINER'S REPORT ON THE GAS SUPPLIED BY THE ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

.....Quarter of the year 192 .

TESTINGS OF CALORIFIC VALUE, PURITY, AND PRESSURE made at the officially prescribed testing-places situated at

Date and day of week .....

Number of days, including this day, on which testings have been made by all the officially appointed gas examiners in the quarter.....

CALORIFIC VALUE.

(The declared calorific value of this gas undertaking is 500 B.Th.U. gross per cubic foot.)

Calorific value ascertained by this day's testings, in B.Th.U. per cubic foot.

Testing.	Time.	B.Th.U.	Mean B.Th.U. for any Period of Two Hours.*
(1)			
*(2)			
Calorific value for the day . .			
Sum of all previous results in the quarter			
Sum of all results in the quarter to date			
Average calorific value to date .			

* This line and column are to be used only when a testing shows a calorific value more than 5 p.ct. below the declared calorific value, and a supplementary testing has to be made after an interval of not less than one hour, in accordance with section 9 (1) of the Gas Regulation Act, 1920.

SULPHURETTED HYDROGEN.

Time. Absent or Present.

PRESSURE.

Testing of pressure made at
on gas passing through a main of inches
diameter on day 192 ,
at a.m.
p.m.

Inches of Water.

Pressure of Gas:

(Signed).....
Gas Examiner.
Appointed by

Name(s) of Local Authority(ies).

Date.....

To be sent to the Local Authority or Authorities Appointing the Gas Examiner and to the Gas Company.

APPENDIX II.

Gas Regulation Act, 1920.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

GAS EXAMINER'S QUARTERLY REPORT.

An Order, dated March 30, 1921, having been made by the Board of Trade under section 1 of the Gas Regulation Act, 1920, and the Aldershot Gas, Water, and District Lighting Company having given notice of its intention to supply gas of a calorific value of 450 B.Th.U. per cubic foot as from April 1, 1921, and of 500 B.Th.U. as from July 1, 1921, at which latter value 1000 c.ft. are equivalent to 5 therms, the Gas Company is required by the provisions of the Act to supply gas which, when tested in accordance with the provisions of the Act and the prescription of the Gas Referees, shall be: (1) Of an average calorific value for each quarter of 500 B.Th.U. (2) Of a calorific value not more than 6 p.ct. below 500 B.Th.U. on any one day (a "complete 1 p.ct. by which the calorific value is deficient in excess of 5 p.ct." [Gas Regulation Act, section 9 (1)]). (3) Not containing any trace of sulphuretted hydrogen. And (4) at not less than 2 in. (of water) pressure.

I, the undersigned, having been appointed gas examiner to the local authorities named below, HEREBY CERTIFY that in the quarter ended the gas supplied by the Aldershot Gas Company in the districts of those local authorities, has been tested by me in accordance with the provisions of the Gas Regulation Act, and the prescription of the Gas Referees appointed by the Board of Trade under that Act, with the following results:

Average calorific value for the quarter: B.Th.U.
Number of days on which the calorific value was deficient by 6 p.ct. or more
Sulphuretted hydrogen: Present on days.
Number of testings in which the pressure was less than 2 in.:

I THEREFORE CERTIFY that the Aldershot Gas, Water, and District Lighting Company has fulfilled its statutory obligations in respect of the gas supplied by it in the districts of the local authorities named below, except in respect of:

Date .....

.....
Gas Examiner.
Appointed by the
Corporation.
Urban District Council.
County Council.

To be sent, within fourteen days of the end of the quarter, to the Gas Referees, to the Gas Company, and to the Local Authority(ies) appointing the Gas Examiner.

Gas-Furnaces in the Confectionery Trade.

Mr. James Beveridge told the members of the Pacific Coast Gas Association at the recent meeting that in the last few years the candy industry in the United States had increased to a very great extent; and gas can claim considerable credit for this success. It is essential that manufacturing confectioners should have speed in operation, which means a saving in labour costs and a greater output. To obtain this speed, combustion of the gas must take place at a high rate; and this is accomplished with the blast type of furnace. The methods of supplying air to blast furnaces are by fans and by positive-pressure blowers. The fan for this purpose is considered the best, as it supplies sufficient air for candy cooking, and can be operated at a lower cost. Candy furnaces should be designed to eliminate as far as possible loss of heat by radiation. The best arrangement is to construct the furnace so that the products of combustion must travel round the furnace before entering the chimney, thus making the flame come up evenly round the kettle, instead of being drawn to the side where the chimney is located. The shape of the fire-pots should be such as to deflect the heat of the flame against the kettle; and the fire-pots should be heavily lined with sectional firebrick or properly designed insulation. The fan-blast gas candy-furnace is undoubtedly now the standard appliance with all good candy makers, and can take the place of coal or coke furnaces at a material saving.

Chemical Research and Industry.—At a meeting of the Glasgow Section of the Society of Chemical Industry, presided over by Mr. S. B. Langlands, a paper was read by Mr. R. F. Stewart entitled "Leaves from the Notebook of a Research Chemist." Mr. Stewart dealt with chemical research in relation to industry, and contrasted the position of the academic worker with that of the industrial chemist, pointing out that, while the former was able to choose his subjects of study, and avoid what did not interest him, the latter was under the necessity of working at a specific topic with a view to a definite solution of economic value. Nevertheless, the technical worker often obtained results of real scientific value and interest. Rule-of-thumb, said Mr. Stewart, was often contrasted with scientific method; but rule-of-thumb laid the foundation of great scientific processes, and it was necessary for the theorist to tread warily when he attempted to deal with many facts and processes for which even now no scientific explanation was available.

REPLY BY SIR GEORGE BEILBY, F.R.S., AND MEMBERS OF THE STAFF OF THE FUEL RESEARCH BOARD TO THE DISCUSSION ON THE PAPER—"STEAMING IN VERTICAL GAS-RETORTS"—READ AT THE LAST MEETING OF THE INSTITUTION OF GAS ENGINEERS.

[References to illustrations and pages are throughout to the prints distributed to the members prior to the meeting.]

I.—DR. C. H. LANDER.

It is interesting to note the results of Dr. Parker's calculations on the discrepancies between the theoretical and actual delivery of steam through orifices.

At the time when the plans of the Fuel Research Station were laid down, the question of steam measurement was carefully considered by the Board, who decided that it was necessary for all measurements to be made as directly as possible consistently with the required degree of accuracy. They therefore installed a small boiler, as near as possible to the retorts, for the purpose of supplying steam, and into which all the feed water could be accurately weighed, instead of relying upon inferences from the pressures behind calibrated orifices. It should be pointed out that, even if an orifice be calibrated with the gauge actually used for the trials, the results are liable to great error unless precautions are taken which are practically impossible to carry out in large-scale experiments.

The chief disadvantage attending the use of small orifices lies in their liability to changes of discharge caused by partial choking or other alteration in their shape and size. In addition to this important practical objection, it is difficult to guard against errors of a less degree, due to variations in dryness of steam caused by the fluctuating demands of other appliances drawing from the same main, or by draughts of varying velocities and temperatures blowing upon uncovered pipe-joints or even upon lagged portions of the pipe—especially where such pipes pass in part through the open air. Another grave defect in this method is the unreliability of "Bourdon" gauges, which in everyday use can seldom be relied upon to an accuracy greater than (say) one pound either way, especially when used for readings at the lower ends of their scales. It is also necessary to refer all calibrations and gauge readings to absolute pressures; otherwise errors which are by no means negligible occur from changes in barometric pressure.

As Dr. Parker has discussed at some length in his water-gas report the question of steam-flow through nozzles, it will be unnecessary to refer to the fundamental equations of steam-flow. But we can accept as a basis for working-out the possible percentage errors the expression which he quotes. From this expression, Dr. Parker has worked-out a table showing the values of the steam delivered through a nozzle or an orifice over a range of steam pressures from 25 to 70 lbs. gauge, and dryness fractions from 1·0 to ·80.

Let us consider a case where a calibration of an orifice has been carried out at a time when the atmospheric pressure was 14·7 lbs. per square inch, and the dryness fraction of the steam supplied was ·95. Taking a gauge pressure of 35 lbs. per square inch, we see that the expression gives 46·7 lbs. per minute as the theoretical value of the steam discharged per square inch of throat area. For the reasons already given, it is quite justifiable to suppose that we may be using the nozzle for measuring purposes when the dryness has fallen to ·85 or even lower. Reference to the table shows that, with the wetter steam, the discharge would be 49·3 p.ct. lbs. per minute, or 5·6 p.ct. greater than would have been inferred from the original value. Again, suppose that this increased wetness occurred on a day of high barometer, when the atmospheric pressure was 15 lbs. to the square inch. Linear interpolation of Dr. Parker's table gives a value for the weight delivered which is 6·2 p.ct. greater than the original figure. If the pressure gauge was in error to the extent of 1 lb., we have a total error of more than 8·3 p.ct. It should be noted that these errors are not maxima, as there may well be greater variations in both dryness and barometric pressure.

Reference to the coefficients of discharge which Dr. Parker has worked-out from the accurate weighings of steam at H.M. Fuel Research Station for the $\frac{1}{16}$-inch orifice, confirm the possibility of errors of the above magnitude. These coefficients vary from ·42 to ·47, or a variation of nearly 12 p.ct. when taken on the lower value. If similar calculations be made upon the calibration diagrams in the Uddingston report, discrepancies of the same order appear. In view of the uncertainties due to choking, and also of the theoretical difficulties discussed above, I think it will be agreed that the Fuel Research Board were well advised when they decided that calibrated orifices were quite unreliable for measurements other than those of the roughest character.

The disabilities enumerated, however, become of much less importance when the method is used for the control of steam to a vertical retort in everyday running, where measurements of the accuracy required in research work are unnecessary, provided precautions be taken from time to time to ensure against the choking or alteration of the orifice.

II.—COMMANDER J. FRASER SHAW AND MR. J. G. KING.

We endeavour in this written reply to answer the discussion which arose at the annual general meeting of the Institution of Gas Engineers on Tuesday, Oct. 11, 1921, and a further written contribution received since that date.

Mr. Thomas Glover called attention to the reduction in the total heat required for carbonization using 5 p.ct. steam compared with that when no steam is used. This fact does not seem to have been generally recognized previous to the publication of our report; and certainly our attention had not been called to it before the experiments proved with each coal that such was the case. Mr. Glover explained what must be in part the action—namely, that the sensible heat of the water gas generated at the bottom of the retort conveys the heat up through the coal and assists in the distillation of the coal in the upper part of the retort. But it must be also remembered that the heat in the incandescent coke at the base of the retort is made use of in producing this water gas, instead of being carried into the coke-chamber by the falling coke. This use of the heat in the coke was proved at the Fuel Research Station by the fact that on each occasion when we attempted to carbonize the coal without the use of steam, the castings at the base of the retort became red hot, and subsequent examination of the worms has led us to decide definitely that we cannnot afford to carry out further tests without the use of steam.

Mr. Glover mentioned that 5 p.ct. of steam with Mitchell Main gas nuts gave a calorific value of 517 B.Th.U., and that he himself would possibly aim at a gas of 480 B.Th.U. It was hoped that by the use of the graphs, Mr. Glover would have been able to decide very approximately what this gas of 480 B.Th.U. would have cost him. We would suggest that Mr. Glover takes fig. III. and looks at the lowest set of graphs in that figure. He will there see a line indicating the falling calorific value of the gas as the quantity of steam is increased. Let him select the point representing 480 B.Th.U. gas, and then draw a vertical line through the whole of fig. III. He will see that with a gas of that calorific value he should get a volume of 19,800 c.ft.—namely, 95 therms—per ton; and transferring to the upper graphs in that figure, he will see that he should also obtain 13·45 cwt. of coke (of which 2 cwt. would be breeze), 11·2 gallons of tar, and 21·6 lbs. of sulphate per ton of coal. To obtain these results, of course, he would have to work his combustion chambers at 1262° C. The cost of obtaining these products may be found from the centre graph of fig. III. He will there see that he must provide 3 therms of steam to the retort and 15·75 therms of blue water gas to the combustion chambers in addition to the heat which he must continually supply to the settings to keep them at the carbonizing temperature. From Appendix III. it will be seen that 1 therm of blue water gas is equivalent to 1·25 therms of producer gas; and Mr. Glover must decide for himself what is the cost of supplying steam to the retorts and of supplying 19·7 therms of producer gas. He must also decide for himself, by means of a special test such as described in Appendix II., how much heat is required to keep his particular setting at the carbonizing temperature; and he must further work out how much this would cost him. It is in this way that it is hoped gas engineers may be able to make use of the graphs shown, and that the commercial aspect of the problem mentioned by Mr. George Helps may be dealt with.

Mr. Glover also mentioned fig. VIII. as requiring further explanation. We have since been in correspondence with him, and now submit a few words of explanation, which we trust will lead to an easier understanding of this figure.

As Mr. Glover pointed out, with the aid of colouring fig. VIII. can be more easily read. It is suggested that the coal line (_____) should be coloured red; the fuel line (· · · · · ·) both above and below the coal line be marked blue; the coke line (—·—·—·—·—·) should be marked in green; and the tar line (-x-x-x-x-) should be marked in yellow. It will then be seen that:

Base line to red	=	expenditure of steam.
Red to blue	=	expenditure of fuel gas (– below the red line and + above the red line).
Blue to green	=	expenditure of coke.
Green to yellow	=	tar produced.

Another point which should be mentioned is that if the calorific value of the coke from Table V. for 20 p.ct. steaming is transferred into fig. VIII., it will be found that the thermal value does not agree with that shown. There is an apparent error in this calorific value which is clearly attributable to the low ash content in the sample. The calorific value is shown as 12,700, whereas 12,200 is probably nearer the correct value. The latter figure has been used in fig. VIII. We hope that these suggestions and remarks may assist in the interpretation of fig. VIII.

With regard to the recovery of ammonia, no special arrange-

ments were made to influence the yield from different coals. The ammonia recovered from any coal depends on the nature of the coal and on the atmosphere and temperature. In the cases in point, the temperatures and the nature of the coals were constant, and the atmosphere was varied by the injection of steam.

This variation in each case caused an increase in ammonia formed with increased steam, but, as pointed out by Mr. Glover, not to the same extent in each coal. The probable reason for this is a difference in the nature of the coals themselves. A further difference may possibly result from the fact that the Durham and Yorkshire coals contained much less moisture than the Lanarkshire coal, and that the temperature at the top of the retort, as indicated by the ascension pipe temperatures, was considerably higher. (Table 2)

Subsequent to the test mentioned in the report, attempts were made to increase the recovery of ammonia by watering the dry coals. This was not successful in decreasing the top temperatures appreciably, nor in increasing the yield of ammonia.

Mr. Glover appears to have taken the wrong figure for his illustration, as in the case of Mitchell Main coal an increase in ammonia yield is shown with increased steaming. A maximum was, however, reached at 20 p.ct. steaming; and it would appear that in this test, with the ascension pipes showing a temperature of 330° C., the upper part of the retort was so hot that the ammonia formed was not completely protected by the excess steam, and that its decomposition into nitrogen and hydrogen occurred to a serious extent.

Our experience certainly confirms the view of Mr. Thomas Hardie that Durham coal has proved perfectly satisfactory as far as its passage through vertical retorts is concerned. It will be noticed that the quantity of "smalls" in this coal as supplied was very great; but in spite of this feature no difficulty was met with in the regular working of the retorts. Only when the quantity of steam used per retort was increased considerably (some tests later were run up to 50 p.ct. of steam) the quantity of dust which was carried forward from the retorts with the gases caused some trouble through the blockage of the pipes in the region of the retort-house governor. A good deal of the dust actually got through the retort-house governor as far as the first condenser.

Mr. Hardie has also drawn attention to the fact that, when using 20 p.ct. of steam, less coke is consumed in the retorts per therm of extra gas produced when using Consett coal than when using either Mitchell Main or Lanarkshire Main coal. He claims from this that Consett is more suitable for steaming than the other two coals; but unless Mr. Hardie is fortunate enough to obtain his steam for nothing (*e.g.*, from a waste-heat boiler), he will find that the total coke required for raising steam, *plus* that lost in the retorts, still leaves Consett coal behind Mitchell Main, while the comparison in the case of Lanarkshire coal is not truly applicable owing to the relative drop in carbonizing temperature and the increase in the quantity of steam used.

20 to 22 P.Ct. of Steam on—	Consett.	Mitchell Main.	Lanarkshire Main.
Per ton of coal—			
Additional therms of gas produced	11·04	32·54	18·6
Coke to produce steam (at 7 lbs. of steam to 1 lb. of coke) lbs.	67·0	65 8	70·6
Difference in yield of coke from retorts . . . . . lbs.	29·0	136·7	139·0
Total coke . . lbs.	96·2	202·5	209·6
Lbs. of coke per additional therm of gas	8·7	6·2	11·2

The fact that Consett coal appears so much better as regards additional therms per pound of carbon consumed is because the additional gas which results from steaming is richer than pure water gas, and is derived not so much from the coke as from a change in the carbonization reaction of the coal. Where more carbon is consumed (as in the case of the other two coals), more water gas is formed, and the effect of carbonization changes is not so noticeable.

Mr. Hardie has evidently made a slight slip, confusing Test "F" with Test "G" in calculating the additional therms obtained per pound of coke in the case of Mitchell Main coal.

One point of importance which we had not, however, previously appreciated with regard to the selection of coals for use in vertical retorts is the moisture content. As the result of our experience, we can definitely say that a coal containing from 6 to 10 p.ct. of hygroscopic moisture will give better working conditions in the upper part of the retorts, including the ascension pipe and the collecting main, than if the coal contained a low percentage of hygroscopic moisture. The yield of ammonia will also be greater.

A point is raised by Mr. Hardie with regard to the tests of water gas used for fuel. On p. 22 it certainly is ambiguous as to whether the water gas test was from a "snap" or from a continuous sample. On the other hand, in Appendix I., where the details of sampling and analysis are set-out, it is shown that the tests of water gas were from a continuous sample, drawn from the 20,000 c.ft. holder in which the water gas was stored.

Mr. Hardie commented on the throughput of coal which he was surprised to see maintained at the Fuel Research Station when steaming heavily. In a series of tests such as this, it is necessary to cut down the variables to one item; therefore the throughput was maintained at the figure given. We were enabled to do this because of our independent means of supplying fuel gas to the combustion chambers. It is quite realized that, in the ordinary setting, this reserve of heat might not be available, and the throughput would have to be reduced if the same temperature were to be maintained.

Mr. Hardie is probably correct in suggesting that variations in throughput will be sufficient to overcome the difficulties of sticking in the retorts and frothing in the collecting main, and it would be very interesting to be allowed to carry out the tests which Mr. Hardie suggests—varying the throughput until the best results were obtained with steaming. Possibly at some future date the Fuel Research Board may see their way to ordering such tests to be carried out.

Prof. Cobb is slightly in error in imagining that we had to take some special precautions, which are not possible at any commercial gas-works, in order to prevent the dripping of the water from the mouthpieces. In actual fact, the mouthpieces are of the normal type supplied at that date by the manufacturers of the plant. The doors have flat flanges; and let into the casting of the mouthpiece is a core of asbestos. It was merely the renewal of this asbestos which was referred to on p. 28 during Test "G." This of course would be a routine matter where such doors are fitted.

Prof. Cobb also indicated a difference between the setting at the Fuel Research Station and the settings usually fitted at gas-works, which is interesting. In an ordinary setting there would certainly be one, if not two, chambers at the base of the retort devoted to the preheating of the secondary air. In this way, heat which would otherwise be wasted is abstracted from the coke before it leaves the retort. At the Fuel Research Station only one such chamber is fitted; and because of the alternative supply of air through the steel preheater fitted at the top of the setting, it has been possible to make use of this air circulating chamber or not, as was considered advisable. In practice it has been used when steaming at anything less than 20 p.ct.; but when using 20 p.ct. or more steam, no air has been circulating through this chamber. This undoubtedly enabled a higher percentage of steam to be used at the Research Station than could be used at Uddingston, without causing the temperature of the lower chambers to fall. This is shown in Test "K," in which the temperature of No. 2 combustion chamber at the Station was made to compare with the temperature of No. 1 combustion chamber at Uddingston. It was then found (as stated on p. 30) that, in order to obtain the same distribution of temperature as in Uddingston Test III., much less gas was required for this chamber than for the others. At Uddingston, on the other hand, presumably the maximum possible quantity of gas was burnt in this chamber.

Weight Balances.—With Dr. Parker, Prof. Cobb does not believe that weight balances in themselves have any right to be regarded as a real check on the correctness of a test, and that the most reliable check lies in the preparation of elementary and thermal balances. We may say at once that, from our experience of the difficulties of such problems, we do not entirely agree with these gentlemen, for the following reasons:

(1) Both thermal and elementary balances are dependent on the weight balance for their calculation and cannot be compiled without a knowledge of the weights of coal and the products of carbonization. The more elementary balances are obviously a means of checking whether leakage inwards or outwards has occurred. For industrial research work of this nature, the utmost that can be done is to make the measurements which are required for the construction of weight balances with the greatest care; and anything more than this is entirely beyond our control. We have therefore aimed at making these measurements as accurately as possible in the first instance, and publishing frankly the results obtained, rather than judging these results after the event, from the standpoint of elementary and heat balances, and rejecting those which do not conform to some arbitrary standard.

The weight balances at the Fuel Research Station were compiled from actual weights or measurements which are correct to well within 1 p.ct. The only factors which may affect the quantity of gas by direct measurement are the possible loss by leakage, and the possible gain by the drawing-in of air or products of combustion. This was recognized, and it was felt that the accuracy actually obtained might in some cases be due to these factors cancelling-out.

In the balances which Dr. Parker himself prepared, certain of the quantities (coke and steam) were estimated and not actually weighed or measured. It seems, therefore, uncertain whether the accuracy obtained in his tests warrants the preparation of elementary balances from them.

(2) Elementary thermal balances also depend for their reliability on accurate sampling; and though the latter may be carried out with great care, the results are liable to much greater variation than 1 p.ct. This will be readily admitted by anyone with wide experience of the difficulties of coal and coke sampling.

Carbon, being the chief element, does offer an approximate check; and we agree with Prof. Cobb in that respect. In our experiments the carbon balances were watched as well as the weight balances, and the maximum variation of 4·6 p.ct. (see following table) was regarded as evidence of fairly satisfactory sampling.

Weight, Carbon, and Thermal Balances.

	Fuel Research Station. Balances, Loss P.Ct.				Uddingston. Balances, Loss P.Ct.		
Test.	Weight Total Including Steam Losses.	Carbon C in Coal = 100.	Thermal C.V. of Coal = 100.	Test.	Weight Total Excluding Steam Losses.	Carbon C in Coal = 100.	Thermal C.V. of Coal = 100.
A	0·03	2·6	4·7	1	4·74	5·3	5·0
B	0·07	4·5	5·5	2	4·1	4·2	3·5
C	2·42	2·8	1·5	3	2·7	5·7	3·8
D	−0·51	1·6	4·0	4	2·4	3·3	1·0
E	0·06	4·4	6·3	5	−0·5	5·0	2·0
F	0·49	1·3	1·5				
G	0·24	1·5	−0·9				
H	2·34	4·5	1·1				
J	−1·44	−0·9	3·0				
K	1·91	2·7	5·3				
Average variation . .	0·95	2·7	3·4		2·9	4·7	3·1

Nitrogen balances, on the other hand, are not at all reliable, as is shown by the fact that in gas analysis the N_2 is obtained by difference, and is liable to contain the accumulated errors of the determinations of the other constituents. A further uncertainty exists owing to differences of opinion among different investigators as to the correct method of estimating N_2 in coal and coke.

Dr. Parker worked out the thermal balances (Table A) of the ten tests carried out at H.M. Fuel Research Station, and of the carbon balances of Tests "J" and "K" (Table C.) These figures are made use of in the following table, and are shown with the figures calculated by us for weight and carbon balances in the station tests and in the Uddingston tests. In the Station tests the weight balances actually obtained are shown; while in the Uddingston tests the weight balances have been corrected to agree with Dr. Parker, by deducting the estimated losses of steam from the mouthpieces.

This correction shows that the apparent accuracy of the weight balance increases with increased steaming, which is contrary to our experience, and is probably due to over-estimation of steam losses.

For the purpose of comparison, the heat absorbed in the steam carbon reaction is left out of the thermal balances in both cases. Owing to the varying velocity of the gases through the horizontal zones of the retort, it is unlikely that any equilibrium will be equally complete over the whole area of the zone, and the final equilibrium, as shown by the composition of the gases leaving the retort, probably represents a mixture of the outcome of these incompletely balanced reactions, complicated by changes in the composition of the actual coal gas which is being evolved. For these reasons we consider that the course of the reactions in the retorts is too uncertain to form the basis of calculations which are to be of real value in practice.

In the table referred to, it is seen that those of our tests in which weight balances were used as a criterion compare very favourably (by all three methods of checking) with the Uddingston tests, which were specially selected to give good carbon and thermal balances.

In each case where in the Fuel Research Station tests the carbon and thermal balances do not appear to be so satisfactory as the weight balances, the cause can be traced to the inevitable uncertainties of sampling, and not to any fault in the weight balance. This supports our previous argument in favour of weight balances as a check.

In Dr. Parker's further examination of the results, it appears that he has not found himself in disagreement with us over the main issues of the problem. He has, however, raised some questions of detail, which we shall deal with point by point.

Water Balances.—In his criticism of the results which he has obtained by calculation for the water balances of the several tests, Dr. Parker states: "It seems reasonable to assume that figures against the difference item 'water formed by distillation of coal' should be the same in tests with the same coal, providing losses of steam in each one by leakage were negligible." On this hypothesis depends the accuracy of the water balances of the Uddingston tests, and of Dr. Parker's calculations on the Research Station water balances.

The hypothesis is not convincing; and as there is no experimental evidence to substantiate it, all results calculated by its use must remain open to doubt.

Another hypothesis which seems more probable is that the water of distillation decreases with increased steaming. If the hydrogen in the coke remains constant and that in the "excess gas" using steam is approximately the same as in the straight gas, then the hydrogen corresponding to the extra tar and ammonia, which can only come from the coal, would seem to be obtainable only by a reduction in the amount of water of destructive distillation.

It would seem that a loss of steam did take place in Test "H;" and this fact was already recognized and stated (*vide* report).

In the tests on Consett coal, the position regarding water balances is anomalous, owing to Test "A" being abnormal both in gas yield and gas calorific value, and for this reason the relative amounts of steam decomposed in these tests were not discussed in our report.

Excess Air for Combustion.—Attention is drawn to the fact that the concordance of the results obtained for excess air by two methods of calculation is not so good as might be expected. The reason ascribed by Dr. Parker is that the water gas is of "unusual" composition, in regard to its low CO_2 and high CO content. That this is not the reason may be seen from the fact that in Test "J," where the best agreement is obtained, the fuel gas has neither more CO_2 nor appreciably less CO than in any of the other tests.

The discrepancy is really due to the fact that at first all average samples of flue gas were taken in the chimney leading from the preheater, and after the retorts had been working for some time it was found that air which is supplied under positive pressure was leaking from beneath the bottom plate into the flue gas. In the later tests, samples were taken directly from the flue gas circulating chambers, which explains why Tests "J" and "K" show better agreement.

During the recent repairs to the setting, the preheater has been altered to prevent, by means of a sand seal, any leakage of air due to unequal expansion while working.

Heat Losses by Radiation, &c.—Under this heading a defence of the radiation losses of 10 to 7·5 p.ct., as assumed at Uddingston, is made by means of a calculation from the Fuel Research Station figure for the amount of heat required to carbonize 1 ton of Lanarkshire coal.

Dr. Parker's calculation is made on a dry basis; but as the coal moistures in Test 1 (Uddingston) and Test "J" (Fuel Research Station) are almost identical, it can be based more satisfactorily on the tests as actually carried out.

Some uncertainty (affecting all calculations based on the coke used at Uddingston) arises from the fact that the ash and breeze which came through the producer were divided and sampled separately, and that only the figure for the carbon in the ash is given. If the amount of breeze recovered, which cannot be of the same composition as the original coke, has been subtracted from the coke used, a correct result for the carbon consumed will not be obtained.

A calculation on the above basis has been made by us in Test 1 (Uddingston) and Test "J" (Fuel Research Station), as follows:

The volume of the waste gases was obtained from the analysis of the coke used, and from that of the waste gases, working on a carbon basis.

If the gas from the producers is assumed saturated at 60° Fahr. and the figure of 11·50 therms per ton of moist coal (Test "J") be taken as the amount of heat required for carbonization—a proceeding justified by the fact that the coal moistures are practically the same—the heat-balance will be as follows:

Uddingston Test 1. Lanarkshire Coal without Steam.

Fuel to producer, therms per ton (as charged) . .	30·5
Heat in therms carried away in waste gases . . .	13·1
Heat taken up by coal in therms (F.R.B. Test "J")	11·5
Losses by radiation in therms (difference) . . .	5·9
	30·5

Losses by radiation, as percentage of fuel to producer = 19·3 p.ct.

If, however, the producer gas be taken not as saturated at 60° Fahr., but as containing 30 grms. of moisture per cubic metre, which appears to be the upper limit of good practice, the heat-balance will appear as follows:

Fuel to producer, therms per ton as charged . . .	30·5
Heat in therms carried away in waste gases . . .	13 8
Heat taken up in coal in therms	11·5
Losses by radiation in therms (difference) . . .	5·2
	30·5

Losses by radiation, as percentage of fuel to producer = 16·7 p.ct.

It may, therefore, be concluded that the radiation losses at Uddingston were in Test 1 between 16·7 p.ct. and 19·3 p.ct. of the heat of the fuel to the producer—a value considerably higher than that assumed in the Uddingston report, and one we believe to be more probable in the circumstances of the test.

The values calculated by Dr. Parker for the other tests are correspondingly affected.

III.—SIR GEORGE BEILBY.

The cordial reception of this contribution by the Institution of Gas Engineers is very gratifying to my colleagues and myself. We feel that it is of no small advantage to the Board as a National Institution that it should have secured the co-operation and expert criticism of the leaders of one of the most widely-spread industries in the United Kingdom.

Our President (Mr. Goulden), in his opening remarks, placed the main purposes and issues of this inquiry in their true perspective. The attention of gas engineers and chemists is now being concentrated on the production of therms in the form of gas at the lowest possible cost, and preferably with the minimum demand for coal as raw material. For the attainment of this ideal, the application of steam in continuous vertical retorts occupies so important a place that its early investigation has been amply justified.

As further steps towards the same end, "complete gasification" and the independent production of water gas also call for investigation and development. It appears probable that each and all

of these methods will find a place in the future production of gas therms; but the final allotment of methods can only be successfully carried out in the light of trustworthy data, and having regard to the local conditions of individual gas-works.

In introducing to you the Fuel Research Station report, I endeavoured to sum-up the more important results which had been obtained in a form which would supply answers to those questions which would at once arise in considering this operation from a practical point of view.

In this presentation, use was made of the results obtained by the Gas Investigation Committee at Uddingston, and of the earlier results obtained by Mr. Blundell at Macclesfield. It was the desire of the Fuel Research Board that the maximum amount of permanently useful information should be correlated and made available from all three sources.

To those who are familiar with the working of continuous vertical retorts, the introduction of a certain amount of steam at the coke-discharging chamber is regarded as a practical necessity—first, as the most convenient and economical means of keeping the metal work reasonably cool, and secondly, for the prevention of the downward passage and escape of combustible gas when the bottom door is opened for the periodical discharge of coke. For this reason, in our original programme of research we had adopted 5 p.ct. of steam as the datum line, and all our earlier experiments started from this point. It was only after the publication of the results of the Uddingston experiments that we revised this decision, and decided to make steamless tests in order that our results might be more directly comparable with those obtained at Uddingston. We quite realize that, from the more theoretical point of view, steamless tests were desirable; but in the testing of new types of coal for the determination of their suitability, we do not propose to make steamless tests. It may be, however, that the datum line might with advantage be taken at from 3 to 4 p.ct. of steam.

Many of the experiences and observations at the Fuel Research Station have a direct bearing on the more fundamental aspects of these operations. Some of these we hope to develop as time permits; but we regard it as our first duty to indicate the bearing of the well-ascertained facts on the immediate problem of the gas industry—the conversion of the potential therms of coal into therms in the form of saleable gas at a minimum expenditure of capital, labour, and fuel.

As was anticipated from the outset, each type of coal has its special characteristics, which have to be taken into consideration when steaming is to be adopted. The behaviour of the coal during the carbonization stage, and the influence on carbonization of the large volumes of highly-heated gas and steam which pass up from the lower zones of the retort, require further study. The effects of steaming in the lower zones of the retort are modified by the greater or less chemical activity of the coke, and this in turn is mainly affected by the physical and chemical character of the coal. The fusibility of the coal is one of the factors which determine the properties of the coke; and the modification of these properties which may be brought about by the blending of the more with the less fusible varieties of coal has been the subject of much study at the station during the past two to three years. The availability of the nitrogen of the coal for conversion into ammonia is much influenced by the type of coke which is produced during carbonization; and this, in turn, depends on the type of coal and on the temperature and method of its carbonization.

As regards the work of the immediate future, we believe we shall best meet the needs of the gas industry by extending our observations to fresh types of coal from different localities; and arrangements to this end are at present being made.

PRESENTATION TO MR. F. W. GOODENOUGH.

Ten Years' Work as Chairman of the Executive Committee of the "B.C.G.A."

IT was a happy thought that was developed, and resulted in the presentation that was made on Tuesday last week to Mr. F. W. Goodenough, on the completion of ten years' work as Executive Chairman of the British Commercial Gas Association. The person in whose brain was conceived the idea deserves the warmest thanks of the whole of those connected with the gas industry. Whoever was that fortunate person, the conception germinated, and was brought to a successful issue by Mr. H. E. Bloor (York) and those kindred and enthusiastic spirits who operated with him in the pleasant task. Response met suggestion with a promptness which signified much—approbation, appreciation, and a solid consent that what was proposed was richly deserved. About the beautiful Chesterfield suite which was Mr. Goodenough's practical choice on being approached, there will cluster always for him and for Mrs. Goodenough those heartborn expressions of appreciation and thanks which were heard in the Hotel Rubens, in the Buckingham Palace Road, yesterday week. It was there that the President of the Association (Sir George E. Davies, J.P.), the Vice-Presidents, and the members of the General Committee of the Association—the subscribers—invited Mr. Goodenough to lunch. Sir George was in the chair, and at his right-hand side sat Mr. Goodenough and Mr. J. H. Ellis, Chairman of the Plymouth and Stonehouse Gas Light Company, Vice-President of the Association, who made the presentation. To the left-hand side of the President were Mr. D. Milne Watson (Past-President), Mr. H. E. Bloor, and Mr. Thomas Goulden.

After luncheon, the toast of the King was first honoured; and then

The PRESIDENT said: Before asking Mr. Ellis to make the presentation which is the occasion of our meeting to-day, I should like, with your permission, to say a few words. What I have to say I will put in the form of asking you to drink to the toast of "Our Guest" of this afternoon. We all of us, as business men, have appreciated the businesslike way and the organizing methods which have always been the rule in connection with the British Commercial Gas Association. All those who have known best how the working of it has been carried on, will recognize in it the organizing hand and the masterly mind of our good friend, Mr. Goodenough. In connection with the organization, you have had Presidents year by year. Many of them in times gone by have been most able men—men with a national reputation. The Presidents, however, only leave just a fleeting impression upon the working of the Association. Presidents come and Presidents go; but, as far as this organization is concerned, we hope that Goodenough will go on for ever. [Cheers.] Throughout the whole of the existence of the Association at successive meetings which we, or many of us, have attended, we have seen the way in which the work has been going on, and have always desired to express, and have frequently expressed, our appreciation of what he has done. But I am quite sure we shall all be very glad that some more tangible and more lasting expression of this appreciation is now to be made; and all of us are very much indebted to Mr. Ellis and Mr. Bloor, and other leaders of the industry, who started the idea that we should, at the end of the tenth year of the activities of the Association, make this tangible recognition of the excellent work that Mr. Goodenough has done during the whole of those years. We are indebted to these gentlemen for the suggestion, and for carrying through the idea; and I am very pleased, though late in the day, that opportunity has been given to the President, and the Vice-Presidents, to join in the presentation, which, as I understand, was originally only intended to come from those officially connected with the permanent organization. We should all have been jealous if we had been excluded from the opportunity of adding our tribute at least to the respect which the whole industry feels for our friend; and the appreciation we entertain for the work he has done. It is not my part this afternoon to say all that should be said in connection with this matter. This we must leave to those who make the presentation; but I am glad to be able to express my own feelings, and the feelings in the mind of everyone, with regard to our friend and his work, and to ask you very cordially to drink his health.

The toast was very enthusiastically drunk.

Mr. H. E. BLOOR (York), having been called upon by the President, said: The organizing of this presentation was to me a very pleasant matter indeed, as you might know and realize, on account of the unanimity and the helpful expression of good feeling which came to me in the course of doing it. I might perhaps read one or two letters which are typical of quite a large number that I have received. One was from Sir Robert Hadfield. In the course of it he said: "During my presidency of the British Commercial Gas Association, Mr. Goodenough was a tower of strength, and most helpful in every way. Quite apart from his great personal help, he is one of those for whom the world would be better if there were more of them, and who help to make difficult affairs go smoothly. Wishing every success in your good endeavours in recognizing the merits of one who has done so much for the gas world." Another letter was from Mr. Stafford Ellery, in which he had some kind things to say regarding our friend. In another letter, the writer said: "I have always held Mr. Goodenough in high esteem, as well as his tremendous work for the gas industry, and am glad to know that this presentation is being made." A further writer refers to his "splendid work." Mr. Charles Hunt sent a very charming letter; and Sir Dugald Clerk makes use of these typical expressions: "Mr. Goodenough has been, and is, doing splendid work for the gas industry. I have now had the pleasure of working with him for some years, and fully understand the magnitude and importance of his efforts."

Mr. J. H. ELLIS, the Chairman of the Plymouth and Stonehouse Gas Light and Coke Company, Vice-President of the Association, said: As you have heard, we have met together to-day to express our appreciation of a man and his work; and the honour of attempting to express your appreciation has fallen upon me. I appreciate the honour very highly; but the pleasure is greater, because the man is the Chairman of the Executive of the British Commercial Gas Association. Our friend, Mr. Goodenough, has won our gratitude by his untiring zeal, and his unremitting labours in the service of the gas industry, as well as our admiration by the skill and the brilliance of his administration, and our affection by his genial and kindly disposition. With Mr. Goodenough's work, it is impossible to deal in the limited time at my disposal; and, if it were possible, I should not make the attempt, because the ground has been covered in a clear, comprehensive, and lucid way by the late President (Mr. D. Milne Watson) in his masterly survey of the activities of the Association in his address at the Glasgow Conference, which address now illuminates our proceedings. Therefore, we need not trouble about describing Mr. Goodenough's work, because the work of the British Commercial Gas Association is his. He would be the first to admit—to generously admit—the enormous help he had received from the eminent men who have preceded our President in office. He would be the first to admit the advantages he has derived from the varied abilities, and the manifold methods of the admirable staff by whom he is surrounded. [Hear, hear.] He would also acknowledge the support he has received from the officers of gas undertakings throughout the land. I am sure he would. But, after all, the work of the Association has been due to his initiative; and the position he occupies is due to his guidance and his driving force. [Hear, hear.] And we all know it. Now, gentlemen, I have thought to myself sometimes since I knew our friend: "Whatever made him take to this work?" As I perused the "Transactions" of the Association, I could not find out; and at last it

occurred to me that he had natural aptitude and a predisposition for the career he has followed. I will tell you why. He has the advantage of having been born in a favoured land. You know the winds of the Atlantic and the Severn Sea sweep over the Northern coast of the county in which he was born, and on the south the breezes of the English Channel. There is a vast expanse of high moorland in the centre from which water in abundance and entirely unrivalled in purity flows through wooded heights and fertile valleys down to the sea undefiled and unpolluted by smoke. [Laughter.] He has another advantage which comes from the county of his birth. It is the imagination and the grit and bulldog determination, which first conceives the enterprise, and then carries it through like the sea dogs of his native county in the middle ages. Can it be wondered at that young Goodenough when he first came to London, and first saw smoke, should have said to himself: "My mission in life is to restore to this city, and other places of murky atmosphere, the purity of the air, and the luxuriance of the vegetation of my native county." This I have no doubt inspired him; and what has his object been? His object is our object—a thing at which the nation ought to aim—thrift in husbanding the resources of the nation, the great national asset coal. It has been his object and his endeavour to see that the rays of the sun of thousands of years ago are at the disposal of all of us, provided we use them, whether we be peer or peasant, with a determination to obtain from them the full amount of what they contain. In other words that we use what is in the coal, and do not abuse it. Now, gentlemen, Mr. Goodenough has gone a long way on that road, but there is a long way to go yet. If you knew the number of plants that cannot live at Kew on account of the dirt in the London air, you would realize something of the long way you have to go. You would realize it still more if you had been, as I was during the coal strike, on Shooter's Hill, and saw how fair the City of London was with no smoke over it; and if you had been there as recently as I have been, and had seen what it is to-day, then you would realize the distance you have to go to make the atmosphere of London what it was in the middle of the coal strike. Well, gentlemen, as I have said, we have travelled a long time and a long distance on the road. When I was a young man in London, I collided with a lamp in a fog in the middle of the day; and I did not even see the light in the lamp until I had collided with it. That is impossible now. Still we want to see the goal before us; and if we continue to tackle the subject with vigour and persistence, I have no doubt the mists which still obscure that goal will roll away, and, difficult and rugged as the road is, we shall traverse it with success. The help of our friend is always at our disposal. He has got thus far in enlightening men as to the fact that, while there are one-thousand-and-one uses for gas, there are one-thousand-and-one reasons why raw coal should not be consumed in the way it is. To have got this generally acknowledged by educated people is a great thing. His efforts have been bent on getting it firmly in the mind of the country. It is because he has gone so far that we meet to-day to acknowledge his work. We thank him for it. We ask his acceptance of the beautiful Chesterfield suite he has chosen. As he has chosen it, you will know that the design is full of beauty and merit. I make him this presentation now on your behalf, and with the greatest of pleasure; and express the hope that, when he and Mrs. Goodenough are seated by their own smokeless fireside after the daily labour, he will feel there is something accomplished, something done, as he contemplates this beautiful furniture, and will reflect that, high as he stands in public esteem, he stands still higher in the hearts and affections of the members of the gas industry. I have great pleasure in making the presentation. [Cheers.]

As Mr. Goodenough rose to reply, he was received with continued applause.

Mr. GOODENOUGH: It has been said the language of friends is not words but meanings; and I hope you will understand my meaning, in spite of my words being altogether inadequate, when I attempt to thank you for the presentation you have made to me to-day, and Sir George and Mr. Ellis for the far too kind and altogether generous words they have spoken. Sir George and Mr. Ellis both used more than once the expression "friend;" and I could not then help remembering the words of the Greek philosopher, that "it is a good thing to be rich, it is a good thing to be strong, but it is a far better thing to be beloved by many friends." ["Hear, hear."] That is the feeling which fills my heart to-day. The feeling that most came over me as I listened to what Mr. Ellis said, and that possesses me when I look back over the work of the past ten years, is an acute sense of the inadequacy of the work that has been done by me during those years. I feel how little has been done; how much has been left undone; how much there is left to be done. If I look back ten years ago to what I hoped to accomplish so long as I was in charge of the work of the Association, I cannot help feeling a sense of failure at not having accomplished more. But what has been accomplished? A great deal has been accomplished by the Association, although as Mr. Ellis has said there is far more still be done. I am, of course, only speaking of the inadequacy of my own performance. All the work I have done has been rendered possible, first of all by the complete harmony that has always prevailed in the Committees of the Association, because complete unity of purpose has bound all the members together—the purpose of service to the industry. The work has been further rendered possible for me by the high degree of confidence which has been reposed in their Chairman by the Executive Committee and by the General Committee. I have felt that confidence a very great and grave responsibility; a very great trust which by me has been enormously appreciated, but which I am sure you will understand has filled and does fill me with a very great sense of difficulty of accomplishment. Then the work has been made possible (and I want particularly to emphasize this) by the appreciation, from the earliest days, of the possibilities of the Association by a previous and the present Governor of the Gas Light and Coke Company, and by their fellow-Directors. But for the faith in the value of the work of the Association, and the opportunity they have given me to serve it and the industry, the work I have done obviously would have been impossible. I can only say that throughout the ten years—when Mr. Milne Watson was first General Manager, and then Managing-Director, and then Governor of the Gas Light and Coke Company, and last year while President of the Association—I have owed a great deal to him for his support and assistance on all occasions. Then, again, as Mr. Ellis has already said, I should be the first to recognize that the work that has been done has been rendered possible largely by the zeal, energy, and ability, and wonderful loyalty of the staff of the Association, with whom it has been a privilege as well as a pleasure to work during these years. There, again, unity of purpose and service for the Association and the industry has been a binding force all the way through. Then, again, the work has been made possible by the inspiration of the cause for which we are working. Mr. Ellis has spoken of my birth in the land where coal smoke is not certainly a very serious curse. But I cannot help thinking that the first experience of smoke that I had when I came to London was the smoke that has been cured not by gas, but by electricity—that was the filthy smoke on the underground or inner circle railway, the trains on which were then run on soft coal. My first impression of London (in going from Paddington to Victoria Station) was therefore an extremely smoky one. It is a fact that working for the gas industry, we are not, as Mr. Milne Watson said at Glasgow, working merely for the earning of pounds, shillings, and pence. We are working for a cause which makes for public health and public advantage in all directions. This makes it possible to put into the work we are doing all our energies, and all our enthusiasm. But, gentlemen, the dominating feeling we have to-day is, as Mr. Ellis said, that there is so much remaining to be done. There is always work for the onward looking man; and in our great industry we all feel that in its commercial development we have only touched the fringe of the possibilities. There is an enormous amount of educative work to be done—not only the education of the public, but the education of the administrations of many undertakings, as well as the provision and payment of efficient staffs, so that these administrations will understand the need for, and will see that they have staffs to carry out a real commercial policy. We are very far from the ideal of what this great public service might be; and I am sure you will all feel that the work calls for our constant vigilance, our informed initiative, and our unceasing activity for all the years we are left in the industry. In the state of this nation, as well as of this industry, there is no room for complacency, no room for satisfaction with what we have done—only room for going on, and for doing far more. All we ask at the headquarters of the Association is continued support, co-operation, and confidence, tempered by constructive criticism such as we have already received, and which, so far as I am concerned, is crowned to-day by this most generous acknowledgment of what I have tried to do for the industry in the past ten years. I can only say that so long as I can serve the industry, and the industry has use for my services, it will be my happiness to do my best to pull my weight in the boat. Gentlemen, I thank you from the bottom of my heart. [Applause.]

The PRESIDENT called upon Mr. Mason to say a few words.

Mr. MASON: I do really welcome this opportunity of adding our meed of praise to the work of our good chief. I want to say this for the staff: It is one thing to know a man in the Committee room, and across the table; but it is another thing to work with a man week in and week out for ten years, and still look on him as the biggest man we know in the business line. It would really fail those of us who have feelings to attempt to express what we think of Mr. Goodenough, not only in the business line, but in that of friendship—in the friendly spirit and manner in which he has treated every one of us. I say this not only for myself, but most heartily and most truthfully for every member of the staff.

Mr. BLOOR: It is a great pleasure, it has set the seal on our efforts, and the Committee have appreciated it very greatly indeed, that Sir George Davies consented to be present to-day to preside over this little function. He is one of those rare spirits who seem able to find time for almost an infinite variety of occupations and good work. If I were to give you a catalogue of his work you would wonder, as we do, how he manages to find time for performing it all. As an ardent politician and church worker, business man, councillor, and administrator of gas and water companies, his interests are enormous—to say nothing of his own business, which must claim a large amount of his time and work. He is distinctly one of the band of men who have been rightly put in the Presidential chair of our Association. The watchword, the mainspring, and everything connected with the "B.C.G.A." are comprised in the word which the Executive Chairman could not keep out of his remarks three or four times—that is, the word "service." That has been the mainspring of the Executive Chairman's life. I believe it is the mainspring of the work of the Association; and it is the mainspring in the life of our President. He has given us to-day a further instance of his capacity for fitting things in, and doing more work, by coming here at considerable inconvenience in order that he might assist in this function. We accord to him a hearty vote of thanks for doing so. [Applause.]

The PRESIDENT: I thank you sincerely for your kind expression of thanks to me; but I should like to say how very much I feel my inadequacy to fill completely the very important position of President this year of the British Commercial Gas Association. At the same time, I can respond to the spirit in which Mr. Bloor has spoken, by saying that anything I can do to promote the success of the Association during my year of office will be cheerfully done. It has been a very great pleasure indeed to me to be present to-day, and to take part in our expression of appreciation to our guest.

There is to be a meeting of the Yorkshire Junior Gas Association next Saturday afternoon (Nov. 19), in the Darley Street Showrooms, Bradford, when Mr. L. Gillett, the Superintendent of the Thornton Road Gas-Works, will read a paper on the "Working of Continuous Vertical Retorts."

Sir Philip Magnus, M.P., has intimated that, having just entered his eightieth year, and feeling that the time has come when he should contract somewhat the extent of his active duties and responsibilities, he has decided not to offer himself for re-election as representative of the University of London in the House of Commons at the close of the present Parliament.

ELECTRICITY SUPPLY MEMORANDA.

MANY electricity undertakings are now busy extending their cables, and running them into streets where nothing of the kind has previously existed. In order to obtain a shadow of justification for the expenditure, they propose to convert the street lamps from gas to electricity. In view of the cost of conversion, the price of lamps, and the aggregate consumption of the lamps, the change will not be a very profitable one to either the electricity undertakings or to the ratepayers. Although, too, some electrical men, in prosecuting the case for the change, refer to the street gas lighting as "obsolete," they know full well that there is nothing to beat a well-maintained inverted gas-burner for rendering in the streets good service to the public. If the gas-lamps are really obsolete, then it is the fault of the responsible lighting authority; and obsolete gas-lamps can be converted to modern types at an expense that is moderate in the extreme compared with the cost entailed by conversion to electricity. It is true that modern incandescent electric lamps consume less current than their predecessors; but, even so, the lamps are costly to instal and to renew, and the expenditure on current (if a profitable price is charged for it) will not give the same amount of illumination as an equal expenditure on gas. The cost of inverted mantle renewals is low compared with the cost of electric-lamp renewals. It may be taken also that the new cables are being laid in second-rate streets, as the existing ones are bound to be in thoroughfares representing the cream of custom. Therefore the expenditure on cables becomes more and more speculative as extensions are made. Consideration of the facts that per lamp the consumption is lower than formerly, that the houses will require less light than the better class houses in the streets and roads already supplied, and that it is not likely that so much custom other than lighting will be derived from the property in which people reside who are not of the wealthy class, assures that the same average return cannot be expected from these cable extensions.

Excuse for Fresh Expenditure.

Cable Extensions Without Guarantees.

These reflections arise after reading a report by the Electricity Committee of the Hackney Borough Council, as to the conditions on which extensions of distributing mains are made. It is obvious that the consideration and recommendation of a change are due to reluctance on the part of people to comply with present terms; otherwise there would be no need to make a change. Prospective consumers are required under present conditions to guarantee for three years an annual sum equal to 20 p.ct. of the cost of a main extension beyond 20 yards from an existing source of supply. This policy, the Committee say, was justifiable in days gone by, as it sometimes happened that consumers reverted to the use of gas, with the result that the Council had capital sunk in mains which might lie idle for years. Now they do not believe that, electric lamps (the short-lived gas filled type) being eight times as efficient as the old wasteful carbon filament lamps, any person who had once used electricity for lighting would think of using any other artificial light. Of course, that is a mere pious opinion. Many householders using electricity for lighting keep stand-bys in the form of other artificial lights; the necessity for this being within the sad experiences of most users. However, the Committee declare that extensions of the mains are the best [even though expensive] means of developing the sale of electrical energy, and, incidentally, "the sooner complete areas of the borough are covered with mains, the sooner will the Council be able to replace the obsolete gas street lighting which exists in so many roads." Therefore, the Committee now propose that each application for an extension of mains should be considered on its merits, and that there should be no request for a guarantee of a minimum amount other than the quarterly minimum of 10s. At the same time, the Committee are retaining the right of requiring a guarantee when circumstances necessitate. They also throw into their case the bait of work for the relief of unemployment. The foregoing subject was noticed in the issue of the "Electrical Times" for Nov. 3. The succeeding paragraph informed readers that Keighley is unfortunate in its electricity troubles. "It has just had another failure of supply—on Saturday night, at the busy shopping time. Heavy rain and a flooded water-supply source, in combination with fallen leaves, prevented the undertaking from getting a proper supply of condensing water. Bingley, of course, being supplied from Keighley, had a similar unpleasant experience."

Capital Grants *viâ* Unemployment.

There was a paragraph in the early part of last week's "JOURNAL" which showed that great and benevolent enthusiasm exists in some places in the electricity industry to assist the unemployed, and incidentally the electricity industry, by securing grants of money from the Government upon which interest should only be paid, and contributions to sinking fund be provided, when the works become productive. Naturally, this would be regarded by electricity undertakings as excellent business. Poplar has recently been rather prominently in the public eye, by the attitude of the Borough Council regarding the levying and collection of rates; and, in consequence, some of the councillors have been the temporary guests of the country in one of H.M. prisons. The poverty of the district was pleaded as an excuse for the unconstitutional action of the councillors. But we see that the Council have now authorized the Electricity Committee to expedite the work of laying electric supply mains in streets of the borough not at present supplied with current, in order to provide employment under the Government scheme. The proposal will involve a cost of £70,053, of which £33,715 is for labour. The scheme has been submitted to the Unemployment Grants Committee. A further scheme is for the conversion of the public gas-lamps to electricity, at an estimated cost of £5000. This, it is said, will be a non-revenue producing scheme ranking for grants of 65 p.ct. of the interest and instalments for one-half the loan period. The electricity industry is very busy trying to get a good share of the money to be allocated to the relief of unemployment; but if some of the schemes are carried out, the undertakers will find themselves saddled eventually with heavy capital expenditure which may affect seriously their surplus revenue, where they have any.

Safety Fuses and Unjustifiable Charges.

Safety fuses are for the protection of the public from fire; and yet fires occur. The provision of safety fuses is an obligation on the part of electricity undertakings; but there are some of them, it seems, who try to exact from the consumers the cost of renewing them. The London County Council have had their attention called to the matter; and they in turn are submitting it to the Electricity Commissioners. The report of the Highways Committee dealing with the matter is interesting. Under section 6 of the Electric Lighting Act, 1882, electricity suppliers are subject to certain regulations and conditions with regard (*inter alia*) to securing a regular and efficient supply of electricity, and the safety of the public from personal injury, or from fire or otherwise. By the same section, the Board of Trade are empowered to make regulations for the safety of the public from personal injury or from fire or otherwise. Under these powers, the Board made regulations, No. 24 of which provides that the undertakers shall be responsible for all electric lines, fittings, and apparatus belonging to them, or under their control, which may be upon a consumer's premises, being maintained in a safe condition, and in all respects fit for supplying energy. No. 26 of the same regulations requires that a suitable safety fuse or other automatic circuit-breaker should be inserted in each service-line within a consumer's premises as close as possible to the point of entry, and contained within a suitable locked or sealed receptacle of fireproof construction, except in cases in which the service-line is protected by fuses in a street box. In these circumstances, the Committee hold that such safety fuses are under the control of the undertakers, and that they are responsible for renewal, and cannot legally charge the consumers with the cost. It is thought that these facts should be known, as it is possible that many consumers, not being aware of the regulations, pay the charge when it is demanded. The attention of the Electricity Commissioners is to be called to the matter.

Modernizing an Electric Restaurant after Eight Years.

The electrical papers have been going almost into ecstasies over the equipment with electric cooking appliances of a restaurant car on the Great Northern Railway, and the joy has been intensified by an inspection of the modernized equipment of the "B. & K." restaurant in Earl's Court Road. This restaurant was started some eight to nine years ago; but the plant then put in appears to have been entirely superseded. It was at that time stated to be the most perfect in all respects; but we learn from the "Electrician" that the Brompton and Kensington Accessories Company, Ltd. (which is an offshoot of the Electricity Supply Company in the district), have never hesitated to scrap equipment when it has failed to fulfil its purpose, or when something else has been designed that rendered the existing methods out of date. Now the restaurant has been completely modernized with appliances that represent the Company's latest ideas as to perfection. Seeing that the restaurant is under expert surveillance, restaurants not similarly favoured have something to be thankful for that they did not eight years ago follow the lead given by the Company, who have had to scrap with the passing years, and now to completely modernize. This is a rather expensive game; and it only shows what a "long, long road" it is to perfection where electric cooking appliances are concerned. And yet in this restaurant everything is nursed, and kept up to date by experts. We do not desire to speak slightingly of the restaurant. It is a good piece of trading enterprise; but there is a vast difference between electrical equipment so well and carefully tended, and the same equipment when put into an ordinary restaurant without skilled electrical assistance to ensure the best behaviour of which it is capable. The experience at the restaurant has been valuable in discovering defects, and in searching for remedies. The various departments, too, are open for inspection, so that the restaurant is a place of education. Not only are meals served, but there is a counter trade in cakes, which help to advertise the place and electric cooking. The "Electrical Review" says there are 500 cookers on the Supply Company's mains, besides equipments in other restaurants and bakehouses. Of what these

cookers consist is not stated. Whether they are all full-blown ones, or whether a proportion of them are such things as grillers and toasters, is not revealed. Whether they are all in daily use is not disclosed. The "Electrical Times" says there "have been" 500 cookers connected to the mains during the past ten years, which is an average of only fifty a year. "Have been!" Are they all connected now? Among other information, it is seen that for a family of four to six persons, the consumption averages 1 unit per person per day for all meals. This is vague. It does not say whether it includes all the water and other boiling operations that are usual on a gas-cooker.

Other Points.

We will not describe the equipment. From various accounts, it appears to be very complete—and where should it be more so? There is even a control room here where records are made of consumptions and temperature measurements at which every operation should be carried out. This is electrical operation *in excelsis*. Nothing is said as to the cost of the installation, nor as to what the Company would reproduce it for in the case of another restaurant. Probably the figures would stagger, and inquiries would dwindle, by such publicity. However, one great point is made in all the accounts of the fact that the food and the coffee and tea are served at the tables at from 130° to 140° Fahr. There is nothing in this. It shows the completeness of the plate-warming equipment; but atmospheric temperature would make a difference in the serving temperature. The same thing can be done with any other form of heating; and with any other form of heating there need be no more smell from the cooking than with heat produced electrically and expensively. One other thing that is not referred to in detail by any of the accounts is the hot-water supply. In one of them, it is mentioned that water is supplied from a hot-water system at a temperature of 150° Fahr.; and then is brought up to a simmering temperature of 210° Fahr. by means of immersion electric heaters at a low rating. Why this double operation? And what is the means of heating in the hot-water system? If the hot-water system provides the cheapest method of raising the temperature of water from cold to 150° Fahr., then it is the best and most economical means of raising water from 150° to 210°. The accounts of the installation are all interesting, but not very conclusive, and partly because the work is carried on in exceptionally favourable circumstances.

TREATING COAL TO REDUCE SMOKE POLLUTION.

The Gas Industry's Large Part in the Work.

In the current issue of the "Edinburgh Review," Prof. John W. Cobb has an article headed "Coal and Smoke." The article is something more than the title conveys, for in larger part it is a critical survey of the work that is proceeding to provide fuel which progressively must effect an improvement in the conditions of the atmosphere of our urban areas. It is clear from the remarks in the introductory passages, that the author sees nothing in the present situation to induce a hope of realizing again the cheap coal of the past, though happily there is more than a possibility that continued stagnation in some great industries, plainly consequent upon the high price of fuel, may compel an all-round recognition of the fact that the coal industry itself cannot hope to market its product under present conditions, and that its existence is conditional upon the lowering of price. There is concurrence with Prof. Cobb in this. The present condition of coal in regard to price is one which does not fit in with the general economic circumstances of the country; and when this is so, the fact is one that is detrimental to the best national and individual interests. There is a twofold remedy for this state of affairs—for both coal owners and men to work co-operatively for the economical production of coal, and to apply sonnd and scientific methods to the elimination of waste in its utilization. It is in the latter branch of remedial measures that Prof. Cobb, from inclination, study, and knowledge, is interested. He dips into Sir George Beilby's "James Forrest" lecture, and extracts information as to lignite, oil, fuel alcohol, and peat; but the exploration leaves him with coal as the fuel upon which this country must primarily depend. However, the crude burning of bitumuous coal means smoke, with all its unpleasant consequences.

From the coal strike (during which our atmospheric conditions brightened so vastly, and so helped us through the trouble), the advocates of smoke abatement derived a new force. Interest was never before so keen in the discussion of how the warmth and comfort of fire and light may be maintained, and the wheels of power be kept running without incurring the penalty of smoke and soot. The answer up to a certain point is simple; beyond, baffling and difficult. In the great bulk of industrial operations, the emission of smoke is unnecessary. This is Prof. Cobb's declaration; and yet there are no dirtier towns atmospherically than our industrial ones. The emission of smoke in steam-raising is a sign of careless working, over-driving, or bad design. The cure would mean a higher thermal efficiency; and so a saving. Yet smoke emission from factory chimneys continues. The author shows that even a 10 p.ct. saving on fuel in steam-raising would represent 7½ million tons. We should have liked to have seen in the article some emphasis laid on the improvement in the fuel bed, in combustion, and in efficiency, by the combination of coke with coal for steam-raising. But Prof. Cobb passes on to industrial furnaces, and points out that those that emit smoke are of an old type. The cost of fuel and the unwillingness of the men to undertake heavy work is now justifying, and often compelling, attention to these furnaces. Producer gas is being used extensively for large furnaces; but it has one great defect for some kinds of work, owing to being heavily loaded with nitrogen and carbon dioxide (to the extent of some 60 p.ct.), and therefore it cannot produce high temperatures, unless the air used for combustion is preheated, which means complication of design. But the smaller furnaces are the problem; and we read:

> In many instances, by simple alteration, coke can be made to do the work of coal; but the modifications in design necessary to effect this have not received sufficient attention. In nearly every case a higher grade of gas than producer gas, made in a way which does not involve the introduction of nitrogen in quantity, would be satisfactory if it could only be applied at a reasonable price. This consideration limits the application of town gas as now made and distributed. It is time that in some districts like Birmingham, where a large number of small furnaces have to be heated (in the metal industry), large quantities of town gas are supplied for industrial use. The convenience, cleanliness, rapidity of working, ease of control, and thermal efficiency have rendered possible the attainment of ultimate economy. But so long as the unit of heat in gas costs some four to six times as much as in coal, the replacement of coal by town gas must be delayed. The difference is often too great to be made up by greater efficiency in utilization.

There is reference to processes which require a strongly reducing atmosphere to prevent waste of metal by oxidation, and sometimes demand the surface impregnation of metal by carbon. The latter is a particularly difficult condition to satisfy without the formation of smoke. However, with a cheap gas—carburetted, or provided with supplementary oil supply for use at critical periods—the desired effects could almost certainly be obtained, and the emission of smoke eliminated, or at least be regulated and minimized.

Prof. Cobb turns to the domestic use of coal, and to the reduction of smoke therefrom by burning smokeless fuel produced by low-temperature carbonization or gaseous fuel. He deals with low-temperature carbonization; and as a solution of the fuel and smoke problems, it leaves us cold, so far as present experimental practice goes. Here is an excerpt from the article:

> The thermal and monetary cost of carbonization have to be incurred whether coke or semi-coke is made, and the products have to bear that cost. Therefore, as the volume of gas is reduced, a greater proportion of these costs fall upon the coke; and it is difficult to see how coke can carry the increased financial burden. Stated thermally, the position is that gas can be taken as twice as efficient as coal for continuous use, and much more so for intermittent use, but coke cannot be made to do much more than coal. The sacrifice of gas to coke in the process of manufacture is not therefore to be undertaken lightly.

The author, while on this subject, again dips into the writings and sayings of Sir George Beilby; and incidentally, he gives it as his opinion that the claims of electricity were over-stated and over-pressed by the Coal Conservation Committee. With truth, he further says that the concomitant advantages of the use of gas, including, of course, complete freedom from smoke, make it ultimately cheaper than coal for many uses, as is being recognized to an increasing extent. The check on the replacing of coal by gas, however comes too soon; and the check is the price of gas, necessitated by the present cost of production. The conclusion may safely be drawn that domestic and industrial requirements alike require further development in the economies of gas production, if the replacement of raw coal by gas, and the consequent abolition of smoke, is to be realized to the full. Fortunately, the position has been radically changed by the Gas Regulation Act, for the originating work connected with which a tribute is paid to Sir George Beilby and the Fuel Research Board. The features of the Act that are of technical value are pointed out by Prof. Cobb; and the basic importance of the Act, and the power for good which it confers, are shown by a brief review of what is involved in the carbonization and gasification of coal by different processes.

The author describes what happens in horizontal retort working, mentioning, among other things, that 50 p.ct. of the heat of the coal is left in the coke. It is, however, clearly established that for nearly every purpose the value of a heat unit in gas is very much greater than in any solid fuel. It is therefore very desirable that the fixed carbon in the residual coke should be gasified as far as possible. So we come to the manufacture of water gas, and more description for lay readers. But an expression of opinion is: "Although a desirable result can thus be attained by carbonizing in horizontal retorts, and gasifying coke in separate water-gas plant, the employment of two separate processes has obvious disadvantages." Avoidance of the disadvantages is found in the continuous vertical retort and steaming, from which process the author takes us to complete gasification, in which "the two sound principles of internal heating and of completing the gasification of the coal (and coke) in one apparatus are both applied." And later "although this form of plant is not yet sufficiently worked-out to be regarded as standard and established, the difficulties experienced with it are only such as may be expected with confidence to succumb to skill in design, construction, and working." That will be regarded as entirely satisfactory by present designers of plant. But they will not look upon this in quite the same spirit:

> Such a plant might be regarded as likely to realize the ideal of a

process which will produce gas so cheaply and simply as to allow nearly the whole of our domestic heating and a certain portion of our industrial heating to be done by gas instead of coal, but for one great defect which has still to be removed—viz., the intermittent working of the water-gas process. The system of alternate blowing with air and steam produces gas for supply only while the steam-blast is in operation. This involves considerable loss in thermal efficiency, and necessitates complication in construction and operation, all tending to increase the cost of gas produced. It is unlikely that more than sixty heat units can be so obtained in the gas for every hundred existing in the coal gasified.

However, there is quite a simple way in which these deficiencies could be eliminated. If it were practicable to use oxygen instead of air for gasification, the process could be carried on continuously as in an ordinary gas-producer. The alternating blasts of air and steam would be replaced by a continuous current of oxygen and steam; the nitrogen of the air which is the sole reason for the use of the alternating blast would then no longer be present. The amount of oxygen necessary would be that required to maintain the heat in the charge against the cooling effect of the steam. Calculations show that making allowances for the probable losses of heat from such a plant, a thermal efficiency of gas production of about 90 p.ct. should be obtainable in complete gasification. Using the lean coal taken for the calculation, 69,100 c.ft. of gas of a calorific value of 352 B.Th.U. per cubic foot would be obtained from a ton of coal, and with an expenditure of 179 c.ft. of oxygen per 1000 c.ft. of gas made. If the process stopped at carbonization, the make would be 20,900 c.ft. per ton, with a calorific value of 427 B.Th.U. per cubic foot; and the oxygen consumption would be lowered to 107 c.ft. per 1000 c.ft. of gas made. The article then deals with the costs of oxygen production; and the promise is such that there is some reason to hope that in the near future a process of gasifying coal which comes very near the ideal will result from the use of oxygen. This would go far to solve the smoke problem.

The recent carbon monoxide inquiry and the result are touched upon; and then the final words of the article are: "The new Gas Regulation Act leaves the way open for technical and commercial skill to provide that cheap and plentiful supply of gaseous fuel which would determine so largely the continued attainment of cleanliness, hygiene, and economy in the utilization of coal." The article summed-up shows the big mission to be technically and commercially conducted, that is entrusted to the gas-supply industry.

THE DOHERTY SCHEME OF DISTRIBUTION.

Mr. George Wehrle, the Superintendent of the Gas Department of the Denver (Col.) Gas and Electric Light Company, has contributed to the "American Gas Journal" some notes on distribution, in which he advances a theory as to "what constitutes an ideal system." He thinks too much importance is usually placed upon the value of pressure reduction which is attained by the installation of large supply mains carrying low pressure. While the reduction of distributing pressure has a decided advantage within certain limits, this advantage is expensive if the limit is not properly fixed. Since the laws governing the flow of gas in pipes allow volume to be increased either by increased area or pressure, the one of least cost and greatest efficiency should be applied. From the experience of the Denver Company, it has been found that, for the distribution of gas to residential districts, 2-in. mains are of ample size, and larger pipes are a waste of investment.

The use of 2-in. mains in this manner at Denver was started by Mr. H. L. Doherty some twenty years ago; and at the present time, out of a total of 370 miles of mains, 200 miles, or 54 p.ct., are of 2-in. size. Indeed during the past ten years, 90 p.ct. of the mains laid have been 2 in., with the other 10 p.ct. consisting of extension of feeder mains required. Mr. Doherty's theory of ideal distribution, affecting the size of mains, is based upon two fundamentals—reduced capital investment and consequent interest charge, and reduced pipe area as influencing unaccounted-for gas. By the first principle, he saves 50 p.ct. in investment and interest charges, which allows the main to be replaced, if necessary, at a later date, through lesser longevity or increased consumption, and money still to be saved. The second principle allows higher general pressures to be carried without increasing unaccounted-for gas. The boosting plants maintain a minimum of 3 in. water column, and a maximum of 5 in., at the lowest pressure point in the system. This requires excessively variable or high pressures on the greater part of the distribution system, which is provided for by the installation of individual service regulators. Out of a total of 50,000 house services, 30,000 require regulators.

In the Doherty scheme of distribution, advantage is at all times taken of the increased conductivity secured through a supply obtainable from both ends of a small main, or the middle discharging in the middle, at both ends, or along the length of the main. Pressure complaints are an unknown trouble; and, after twenty years' use, maintenance and replacement cost is a negligible expense.

The next congress of the Royal Sanitary Institute will be held at Bournemouth from July 24 to 29, 1922, by invitation of the Mayor and Town Council.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A MEETING of the Central Executive Board of the National Gas Council was held on Tuesday, the 8th inst., at No. 30, Grosvenor Gardens, S.W.—Mr. D. MILNE WATSON in the chair.

A representative was appointed to represent the Council on the Standing Committee of the Federation of British Industries on Works Organization. The first subject to be referred to this Committee is the proposed Government Bill dealing with factory effluents flowing into streams or rivers, and incorporated in the Salmon and Freshwater Fisheries (No. 2) Bill.

WELSH NATIONAL EXHIBITION.

The steps which the South Wales District Executive Board of the Council propose to take for the necessary participation of gas undertakings in South Wales at the forthcoming exhibition was reported, and received the unanimous approval of the Board

BRITISH EMPIRE EXHIBITION, 1923.

It was reported that representatives of the Council had already been elected to the Exhibition General Committee; and it was agreed to refer to the British Commercial Gas Association in the first instance the question of the policy to be adopted by the gas industry in regard to representation at this important exhibition in 1923.

CANDIDATE FOR OFFICE OF PRESIDENT OF THE COUNCIL.

It was reported that no nominations for this office had been received, and that it would therefore devolve upon the Board at their next meeting to nominate a candidate to be submitted to the annual meeting, which is to take place on Dec. 14.

HONORARY MEMBERS.

It was reported that present honorary members of the Council were Sir Hallewell Rogers, M.P., and Mr. W. Doig Gibb. Further names were submitted and considered.

ANNUAL MEETING.

It was agreed that the Council's financial year should be amended to end on March 31 in each year, and that the annual meeting of the Council in future years be held in June. A resolution to this effect will be submitted to the members of the Council at the annual meeting, in order that the constitution and rules may be amended, should this course be approved.

ANNUAL REPORT AND ACCOUNTS.

A draft of the Council's annual report and accounts for the financial year ended Sept. 30 was submitted and approved. It was reported that the accounts had previously been examined and approved by the Finance Committee.

Various minor amendments were made to the report on the suggestions of members of the Board; and, subject to such amendments, the report and accounts were approved.

SPENT OXIDE.

It was reported that a summary had been compiled of the returns made to the Council by gas undertakings, showing the stocks of spent oxide in various parts of the country and the estimated production for the following twelve months.

The question of the action to be taken by the industry in this matter was fully discussed; and it was decided to communicate details of the position to the Secretaries of the District Executive Boards, in order that the views of each district on the subject might be obtained.

UNEMPLOYMENT RELIEF GRANTS.

It was reported that the Council had communicated with the Unemployment Grants Committee, the Prime Minister, and other members of the Cabinet in order to secure for gas companies similar grants to those that were being made to municipal undertakings.

The Grants Committee had stated that they had no power to extend such grants in the manner suggested. No definite answer has, however, yet been received from the Government.

A letter was submitted from the Gas Companies' Protection Association relating to the Trades Facilities Bill now before Parliament; but it was considered that this Bill would not prove of any material service to the gas industry.

It was reported that promoters of certain electricity schemes were applying for a considerable amount of money from the Government; and the District Executive Boards were particularly asked to watch this matter carefully, and to report to headquarters immediately any proposals made, so that the interests of the gas industry might be protected.

APPOINTMENT OF GAS EXAMINERS UNDER THE GAS REGULATION ACT.

It was reported that the opinion of counsel had been sought with regard to the meaning of the words "competent and impartial person" referred to in the Gas Regulation Act, but that counsel's opinion had not yet come to hand. It was stated that it might be necessary for the Council to bring a test-case in order to get a ruling on this point.

A suggestion was made that the best person to combine these

qualifications would be someone connected with a technical institute not under municipal control.

Arising from a resolution of the Manchester District Executive Board, the question of the possibility of the duplication of gas examiners was very carefully considered; and it was agreed that steps would have to be taken to prevent such an occurrence. It was decided that the views of the District Executive Boards should be sought on this matter, in order that a comprehensive statement might be forwarded on behalf of the National Gas Council to the Gas Referees.

MONTHLY MEETINGS.

It was resolved that in future the monthly meetings of the Central Executive Board should begin at 2.15 p.m. instead of 2.30 p.m. as heretofore.

BRITISH COMMERCIAL GAS ASSOCIATION.

Report of the Executive Committee presented to the General Committee on Tuesday, Nov. 8.

FINANCE—SUBSCRIPTIONS.

The Executive have pleasure in reporting that the number of undertakings that are now subscribing on the joint basis has reached the figure of 520, which is an increase of 207 since the last report. These 520 undertakings represent, reckoned on a basis of output, 67 p.ct. of the total industry.

A large number of undertakings, formerly subscribing to the Association on the old basis, have not yet replied to the joint appeal; but steps are being taken to follow-up the appeal with a view to securing the continued support of all former subscribers, and a further influx of subscriptions is confidently expected. The work of keeping in touch with all the subscribing and interviewing all "likely" non-subscribing undertakings is becoming of great importance, and engages much of the time of the Manager. In pursuance of this work he is enabled to render frequent service to subscribing undertakings with whose difficulties he becomes acquainted.

Applications for payment of subscriptions for the year 1921-22 are now being sent out by the National Gas Council, and, having regard to the fact mentioned on previous occasions, that none of the organizations—the National Gas Council, the British Commercial Gas Association, and the Institution of Gas Engineers—has any working capital, members are specially asked to arrange to pay of subscriptions as early as possible in the financial year.

HOUSING.

The Association continue to give service to members in connection with this important subject, and in several cases the Association's housing expert or the Executive Chairman has been able to settle negotiations at personal interviews with the officials of the Ministry of Health.

Recently the attention of the Association was drawn to a reported agreement between the Association of Municipal Corporations and the Ministry of Health as to the terms upon which gas-mains should be laid to housing estates. It was ascertained that the terms had not been submitted to, or approved by, any of the municipal gas departments concerned, and were regarded by them as very unfavourable and quite unacceptable.

The Chairman communicated with both the Association of Municipal Corporations and the Ministry of Health, with the result that a deputation appointed by a conference of representatives of the gas departments concerned met the Law Committee of the Association of Municipal Corporations on the 20th ult.; and a letter has since been addressed by the Secretary of that Association to the Ministry, from which the following is an extract:

> "My Committee have further considered the question of gas mains and fittings, and have conferred thereon with other representatives of gas undertakings. As a result of this conference it appears to my Committee that it will be impracticable to lay down any general principle upon which the amount to be charged against the housing account can be ascertained. They understand that in many cases the question has been discussed with your department and a basis of agreement arrived at; and it appears to them that the best course would be for each case to be dealt with on its merits. They would be glad, therefore, to withdraw their proposals so far as they relate to gas."

This satisfactory result has been communicated to the various municipal gas departments, who will now be free to negotiate with the housing authorities, according to local circumstances.

DISTRICT CONFERENCES.

The Executive recommend that the policy of holding conferences in the various districts be continued during the coming year. The subject has already been tentatively taken up in several districts and preliminary details discussed. They further recommend that, subject to the approval of the members for each district, the conference shall be devoted (1) to the private discussion of (*a*) proposals for "commercial education" in the industry, which it is hoped will be available for consideration at the time the conferences are held, and (*b*) sales development and commercial organization; and (2) to the public discussion of the utilization of gas for domestic purposes, (*a*) for hot-water supply, and (*b*) in relation to the important question of the hygiene of gas heating. Where possible, and desirable, an evening lecture on the question of Smoke Abatement, to be delivered by Dr. C. W. Saleeby, will be arranged.

SECOND REPORT OF THE DEPARTMENTAL COMMITTEE ON LIGHTING IN FACTORIES AND WORKSHOPS.

The above-mentioned report has been referred to the Association and to the Institution of Gas Engineers by the National Gas Council, with particular reference to the recommendation regarding the prevention of "glare."

FLUELESS GAS HEATING-STOVES.

The Chairman has interviewed representatives of the "Lawson" Manufacturing Company on the subject of their advertising their stoves as being suitable for use in any room without a flue; but has so far obtained no satisfactory amendment of their advertisements.

CHILDREN'S CHRISTMAS COMPETITION, 1921.

Details of the Children's Christmas Competition are circulated; and it is hoped that members will co-operate to the fullest possible extent in making the competition a success. The Executive feel that this scheme needs no further advocacy to commend it to the notice of members. Full particulars of the competition will be circulated to all members in due course.

POSTER COMPETITION.

The Poster Competition, discussed and approved at the previous meeting of the General Committee, has been very well taken-up by gas undertakings generally throughout the country; and between 4000 and 5000 entry forms have been supplied to, and distributed by, members. Some 500 entries have been received; and the judging of the designs is about to be proceeded with.

"B.C.G.A." BYE-PRODUCTS AND COAL SMOKE ABATEMENT EXHIBIT.

This educative display continues to be in keen demand for use at exhibitions and in members' show-room windows, and reports received from individual members indicate that the exhibit creates a very considerable amount of interest wherever it is on view to the public. Recent evidence of this was to be seen at Newcastle-on-Tyne and Rochester. A very gratifying result of the display in the show-rooms of the latter Company was that applications were received from two of the Government Educational Instructors in the Naval Dockyards for duplicates of the exhibit, to form a permanent part of the educational curriculum. The far-reaching effects of such publicity cannot be estimated, seeing that some 15,000 men and boys pass through the dockyards during the year.

EXHIBITIONS.

The Executive have had under consideration the whole policy of gas exhibits at the various important exhibitions to be held in different parts of the country, and, after careful consideration, have decided that the Association's income is not sufficient to warrant the taking of space at these exhibitions, but recommend that the Association co-operate, as far as possible, with local undertakings or kindred associations by arranging for the loan of its bye-products and smoke abatement display and the supply of a certain quantity of literature.

PUBLIC WORKS, ROADS, AND TRANSPORT EXHIBITION.

The above exhibition is being held at the Royal Agricultural Hall from Nov. 17 to 25, and a conference has been arranged in conjunction with the Institution of Gas Engineers for Friday, Nov. 18. Four papers, as follows, are being delivered at the Conference:

(*a*) "The Utility of Benzole."—Paper by Capt. de Normanville.
(*b*) "Public Lighting by Gas."—Paper by Dr. Thomas.
(*c*) "Coal Tar for Road Work."—Paper by Mr. H. W. James.
(*d*) "The Reduction of Atmospheric Pollution resulting from the Use of Gaseous Fuels."—Paper by Dr. J. S. Owens.

The conference should prove an excellent means of presenting, to municipal authorities particularly, information on the gas proposition generally; and representatives of the industry are invited to attend the meetings and take part in the discussions.

Thin Sheet-Steel Standpipes.—In the course of a discussion on the Congdon scrubber standpipe system, at the meeting of the Michigan Gas Association, Mr. N. G. Caputi, of Grand Rapids, gave some details of a standpipe system used in his plant consisting of 12-gauge steel, with welded joints, rectangular in design. The theories on which this design is based are: (1) Increased radiation over cast-iron pipe, due to thin material used and the increased perimeter or exposed surface. (2) Owing to increased cross-section, the velocity of the gas is greatly reduced, thus increasing the radiation. (3) Comparative smoothness of the interior walls of the steel pipe offers less possibility of any incrustation adhering to the walls. (4) The coefficient of expansion of sheet steel is greater than that of cast iron. Therefore any change in temperature produces a greater differential in expansion between the steel and the deposit; and this causes any deposit to become more easily dislodged. (5) Greater condensation is induced; and this prevents adhesion of tarry materials to the walls. The Company have three benches completely equipped with these thin sheet-steel standpipes, two of which are giving excellent results. The third bench has not as yet been placed in operation.

INSTITUTION OF GAS ENGINEERS' REFRACTORY MATERIALS COMMITTEE.

Revision of Specification.

STANDARDIZATION OF THE AFTER-CONTRACTION TEST.

Preliminary Report.

By Miss D. A. JONES, B.Sc.

Considerable experience with the after-contraction test has made desirable a revision of the original method devised when our knowledge of the subject was less complete. It has been found that tests with different portions of the same brick do not always

Results of Experiments on Whole Bricks.

Small Pieces from Length.		Whole Bricks Change in Length.		Small Pieces from Width.		Whole Bricks Change in Width.	
Per Cent. Change.	Mean.	Per Cent. Change.	Mean.	Per Cent. Change.	Mean.	Per Cent. Change.	Mean.
I. (*a*) − 0·1739 (*b*) − 0·1240	− 0·149	A (*a*) − 0·0265 (*b*) − 0·0622 B (*a*) − 0·0446 (*b*) − 0·0355 C (*a*) − 0·0620 (*b*) − 0·0531 D (*a*) − 0·0532 (*b*) − 0·0531	− 0·044 − 0·040 − 0·057 − 0·0531	(*a*) − 0·1432 (*b*) − 0·1507	− 0·147	A (*a*) − 0·0724 (*b*) − 0·0546 B (*a*) − 0·0360 (*b*) − 0·1627 C (*a*) − 0·1265 (*b*) − 0·0905 D (*a*) − 0·0899 (*b*) − 0·0899	− 0·063 − 0·099 − 0·108 − 0·089
II. (*a*) − 0·227 (*b*) − 0·1947	− 0·211	A (*a*) − 0·0896 (*b*) − 0·0805 B (*a*) − 0·1074 (*b*) − 0·1433 C (*a*) − 0·4317 (*b*) − 0·4393 D (*a*) − 0·4711 (*b*) − 0·4340	− 0·085 − 0·125 − 0·435 − 0·452	(*a*) − 0·3294 (*b*) − 0·4558	− 0·393	A (*a*) − 0·0529 (*b*) − 0·2678 B (*a*) − 0·1358 (*b*) − 0·1792 C (*a*) − 0·3734 (*b*) − 0·4767 D (*a*) − 0·5196 (*b*) − 0·5344	− 0·161 − 0·157 − 0·425 − 0·527
III. (*a*) − 0·1266 (*b*) − 0·1042	− 0·115	A (*a*) + 0·1584 (*b*) + 0·1762 B (*a*) + 0·1497 (*b*) + 0·1772 C (*a*) + 0·1148 (*b*) + 0·0614 D (*a*) − 0·1237 (*b*) − 0·1051	+ 0·167 + 0·163 + 0·088 − 0·114	(*a*) − 0·1016 (*b*) − 0·0498	− 0·076	A (*a*) + 0·1995 (*b*) + 0·2178 B (*a*) + 0·1453 (*b*) + 0·1276 C (*a*) + 0·0712 (*b*) + 0·0715 D (*a*) − 0·1798 (*b*) − 0·0892	+ 0·208 + 0·136 + 0·071 − 0·134
IV. (*a*) + 0·1311 (*b*) + 0·2621	+ 0·197	A (*a*) − (*b*) − B (*a*) − (*b*) − C (*a*) − (*b*) − D (*a*) − 0·071 (*b*) −		(*a*) + 0·1909 (*b*) + 0·1669	+ 0·179	A (*a*) + 0·0881 (*b*) + 0·2099 B (*a*) + 0.0528 (*b*) + 0·2119 C (*a*) (*b*) + 0·0884 D (*a*) + 0·1404 (*b*) + 0·0848	+ 0·149 + 0·132 + 0 088 + 0·112
V. (*a*) + 0·518 (*b*) + 0·1012	+ 0·077	A (*a*) + 0·2387 (*b*) + 0·1761 B (*a*) + 0·2125 (*b*) + 0·1586 C (*a*) − (*b*) + 0·1756 D (*a*) − (*b*) + 0·2282	+ 0·207 + 0·185 + 0·175 + 0·228	(*a*) + 0·1571 (*b*) + 0·1547	+ 0·156	A (*a*) + 0·1469 (*b*) + 0 2367 B (*a*) + 0·1293 (*b*) C (*a*) + 0·0906 (*b*) + 0·0908 D (*a*) + 0·1988 (*b*) + 0·0912	+ 0·192 + 0·129 + 0·091 + 0·145
VI. (*a*) + 0·0270 (*b*) + 0·0266	+ 0·027	A (*a*) + 0·0530 (*b*) − B (*a*) + 0·0709 (*b*) + 0·0881 C (*a*) + 0·0532 (*b*) − D (*a*) + 0·0892 (*b*) + 0·0887	+ 0·053 + 0·079 + 0·053 + 0·089	(*a*) + 0·0796 (*b*) + 0·0794	+ 0·079	A (*a*) + 0·0554 (*b*) + 0·0182 B (*a*) + 0·0551 (*b*) + 0·0184 C (*a*) + 0·1085 (*b*) + 0·0554 D (*a*) + 0·1074 (*b*) 0·0000	+ 0·037 + 0·037 + 0·081 + 0·051
VII. (*a*) + 0·1090 (*b*) + 0·1530	+ 0·131	A (*a*) + 0·1309 (*b*) + 0·1396 B (*a*) + 0·1486 (*b*) + 0·1399 C (*a*) + 0·1573 (*b*) + 0·1749 D (*a*) + 0·1477 (*b*) + 0·1826	+ 0·135 + 0·145 + 0·166 + 0·165	(*a*) + 0·1354 (*b*) + 0·1618	+ 0·148	A (*a*) + 0·1061 (*b*) + 0·0883 B (*a*) + 0·1415 (*b*) + 0·1413 C (*a*) + 0·1421 (*b*) + 0·1237 D (*a*) + 0·1751 (*b*) + 0·1579	+ 0·097 + 0·142 + 0·133 + 0·167
VIII. (*a*) + 0·1299 (*b*) + 0·1003	+ 0·115	A (*a*) + 0·2966 (*b*) + 0·3309 B (*a*) + 0·1609 (*b*) + 0·2221 C (*a*) + 0·2322 (*b*) + 0·1517 D (*a*) + 0·3229 (*b*) + 0·2057	+ 0·314 + 0·192 + 0·192 + 0·265	(*a*) + 0·1839 (*b*) + 0·1557	+ 0·165	A (*a*) + 0·1433 (*b*) + 0·1450 B (*a*) + 0·0539 (*b*) + 0·0882 C (*a*) + 0·0905 (*b*) + 0·1257 D (*a*) + 0·1078 (*b*) + 0·1800	+ 0·144 + 0 071 + 0·109 + 0·144
IX. (*a*) − 0 0267 (*b*) − 0·0528	− 0·040	A (*a*) 0·000 (*b*) + 0·0442 B (*a*) + 0·0706 (*b*) + 0·0533 C (*a*) + 0·0972 (*b*) + 0·0620 D (*a*) − 0·008 (*b*) 0·000	+ 0·022 + 0 062 + 0·079 − 0·004	(*a*) − 0·0267 (*b*) − 0·0251	+ 0·026	A (*a*) 0·000 (*b*) 0·000 B (*a*) + 0·1095 (*b*) + 0 0734 C (*a*) + 0·1091 (*b*) + 0·1820 D (*a*) 0·000 (*b*) + 0·018	0·000 + 0 092 + 0·145 + 0 009
X. (*a*) − 0·6569 (*b*) − 0·6439	− 0·650	A (*a*) + 0·1411 (*b*) + 0·2027 B (*a*) + 0·1148 (*b*) + 0·1468 C (*a*) + 0·1408 (*b*) + 0·0794 D (*a*) + 0·2017 (*b*) + 0·1754	+ 0 172 + 0·131 + 0·110 + 0·189	(*a*) − 0 7202 (*b*) − 0·6770	− 0·699	A (*a*) + 0·2514 (*b*) + 0·2709 B (*a*) + 0·1086 (*b*) + 0·1086 C (*a*) + 0·0546 (*b*) + 0·1643 D (*a*) + 0·2155 (*b*) + 0·1604	+ 0·251 + 0·109 + 0·109 + 0·188

The + sign indicates expansion. The − sign indicates contraction.

NOTE.—No. X. is a repetition of No. III., and again the measurements show expansion in the whole bricks but contraction in the small pieces.

give concordant results; and therefore it is very necessary that some method should be devised which will minimize the errors of experiment.

Up to the present, the test has been carried out on small pieces of material, the ends of which are ground flat on a carborundum wheel, and the contraction measured by means of Vernier callipers reading to 0·1 mm. In some cases—*e.g.*, portions from special shapes—the amount of material available is insufficient to obtain a specimen of specification size (viz., 4½ in. by 4½ in.).

The following tests were made on the whole brick, instead of smaller pieces. The idea was to find if a better average could be obtained with larger pieces. The Institution of Gas Engineers Committee selected relatively small test-pieces, because it was thought that the test would be easier with small than with large pieces. It is not easy to get a small testing-furnace to uniformly heat large pieces. Two measurements were taken along the length, and two along the width of the brick-face; and the mean of each pair of readings is taken. The temperature was raised over a period of four hours, and maintained at the maximum temperature (*i.e.*, Cone 14 for firebricks and Cone 12 for silica bricks) for a further period of two hours, in order to ensure a thorough soaking of the bricks. The temperature is determined by an accurate pyrometer, and checked at short intervals—*e.g.*, every quarter-hour. It is, however, desirable to use cones as indicators, as pyrometers can easily give incorrect results. But, on the other hand, when the appropriate cone has squatted, it ceases to give any further indication of the temperature, and therefore the pyrometer must be relied on for the constant temperature period. Cones, of course, *per se* do not measure temperatures.

METHOD OF PROCEDURE.

The bricks are heated in a surface combustion furnace which gives a clear and even heat. The furnace is easily manipulated so that the rise of temperature is very readily regulated. The air inlet was kept open as much as possible, so as to ensure an oxidizing atmosphere. In order to obtain comparative figures, small pieces, 3 in. by 2 in., are fired at the same time as the whole bricks. Two of these are taken parallel to the length, and two parallel to the width of the brick, respectively.

Great care must be exercised in the heating of silica bricks, as they easily fracture if too suddenly heated. The flame must not be allowed to impinge on the bricks when lighting-up the furnace. To obviate this difficulty, a screen is placed between the bricks and the burners on each side of the furnace. The iron sheets are removed when the furnace has become thoroughly warmed.

Six different types of brick have been tested; and the figures obtained will be found in the accompanying table. An examination of the results shows considerable diversity in the readings, even in the same brick. In some cases it is very difficult to get an exact reading, because, after firing, the small pieces of grog seem to project, and thus spoil the readings obtained by the calipers. In some cases, because of this trouble, the readings have been discarded altogether. No. III. gives a typical example in the variation of the readings; for in three of the bricks there is expansion, while the fourth shows contraction. This particular test, however, will be repeated for verification.

Various sources of error may be suggested. Unequal mixing of the ingredients, and insufficient firing in the manufacture of the brick, may prove to be a serious source of error. Then, again, during the burning of the bricks, the end of the brick nearer the "bag" will probably be burnt more than the other end, thereby causing a diversity in the results. The chief source of error seems to be the dislocation of the surface of the brick after firing. Consequently, the calipers measure not only the change in length, but also an indefinite surface change. These experiments show that the errors are not eliminated by using whole bricks for the test; and the following method of testing has been suggested by Dr. Mellor: Two marks are made on the brick at a convenient distance apart—say, 18 cm.—and the distance measured before and after the firing by a pair of measuring microscopes. This method will form the subject of a later report.

NORTHERN DISTRICT MEETINGS.

National Gas Council District Executive Board and District Committee of the Federation of Gas Employers.

The Annual Meetings of the District Executive Board of the National Gas Council and the District Committee of the Federation of Gas Employers for the Northern District were held at Newcastle-on-Tyne on the 18th ult.

The report of the District Executive Board showed an increase in membership of ten undertakings during the year, and of the Federation an increase of four.

Officers were elected as follows:

District Executive Board: Chairman—Mr. Norman S. Cox (Sunderland). Vice-Chairman—Mr. F. P. Tarratt (Newcastle-on-Tyne). Secretary, Mr. Herbert Lees (Hexham). Representative elected on the Central Executive Board—Mr. T. P. Ridley (Newcastle-on-Tyne).

Federation of Gas Employers: Chairman—Mr. F. P. Tarratt (Newcastle-on-Tyne). Vice-Chairman—Mr. C. Dru Drury (Sunderland). Secretary, Mr. Herbert Lees (Hexham). Representative on the Central Committee—Mr. J. E. Blundell (Carlisle).

The respective Committees were re-elected.

The Joint Managers (Messrs. E. J. Fottrell and S. S. Ogilvie) were present, and addressed the meeting on matters now being dealt with by the two organizations.

PUBLIC WORKS CONGRESS.

On Friday of this week (Nov. 18), the proceedings of the Public Works, Roads, and Transport Congress, at the Royal Agricultural Hall, Islington, will be devoted to matters of interest to the gas industry.

The complete programme for the day, which is being organized by the Institution of Gas Engineers, at the request of the General Committee of the Congress, is as follows:

Friday, Nov. 18.

11 a.m. Papers:

"Public Lighting by Gas." By Dr. J. S. G. Thomas and Mr. Dean Chandler, of the South Metropolitan Gas Company.

"The Utility of Benzole for Transport Purposes." By Capt. E. de Normanville, Member of the Technical Staff of the National Benzole Association.

2.30 p.m. Papers:

"Coal Tar for Road Work." By Mr. Hugh James, Manager of the Tar Works of the South Metropolitan Gas Company.

"The Reduction of Atmospheric Pollution resulting from the Use of Gaseous Fuel." By Mr. J. S. Owens, M.D., Assoc.M.Inst. C.E., F.R.S.I.

Chairman: Mr. Thomas Hardie, Deputy Chief Engineer, Gas Light and Coke Company (President of the Institution).

Those desiring copies of the papers can obtain them from Mr. W. T. Dunn, at the offices of the Institution, No. 30, Grosvenor Gardens, S.W.; the Congress Committee having entrusted all the arrangements for the day to the Institution, all members of which are invited to attend, and may obtain season tickets of admission on application to Mr. Dunn.

Messrs. Tilling Stevens, Ltd., have kindly placed a saloon omnibus at the disposal of those attending, for conveying them from the Agricultural Hall to Trafalgar Square at the end of each day's proceedings. It will leave the hall at 6.30 p.m.

HIGH-PRESSURE DISTRIBUTION IN ALSACE.

A Small but Interesting Undertaking.

The town of Barr, situated between Strasbourg and Sélestat on the eastern slopes of the Vosges, says the "Journal des Usines à Gaz," possesses a gas undertaking owned before the war by the German Compagnie Continentale du Gaz de Dessau. This Company had used it as an experimental station for high-pressure gas, intending to test there various improvements which they were studying. The armistice restored its French nationality to the little township, which numbers 4800 persons. The gas undertaking was sequestrated, and became as to 51 p.ct. the property of Barr, and 49 p.ct. of the Compagnie du Gaz de Strasbourg.

The works comprise two settings of eight horizontal retorts, one setting of five, and one of three. The condensers and purifiers present no outstanding feature; and there is a 500 cub.m. holder. But gas is supplied from there to six communes having a total population of 16,000, of which the most distant, Mutzig, is 22 kilomètres away. The total length of high-pressure main is 52 kilomètres; the pipe being of steel in 10 to 14 mètre lengths, 80 mm. in diameter, and following the main road. Thanks to the general contour of the country, there are very few (but carefully marked) syphons *en route*.

Each commune receives its gas from the main at a pressure of 2 to 3 kilos. into a governor which distributes it at a pressure of 60 mm. of water. There is no relief holder. A compressor, driven by a 6-H.P. electric motor, draws 65 cub.m. an hour from the make at Barr, compresses it to 1 to 3 kilos., and drives it into four sheet-steel reservoirs at Mutzig. Each of the latter has a capacity of 49 cub.m. The gas in them and the 22 kilomètres of main total 550 cub.m. at a pressure of 2 kilos. The sides of these reservoirs are 7 mm. thick, the tops and bottoms 10 mm.

Two points are of particular interest: 1.—The pipe-joints are screwed; their tightness being assured by an unpacked cone. As the joints are from 12 to 14 mètres apart, there is sufficient "give" in the pipe to allow a slight deviation; elbows and tees being easily eliminated. It is clear that such a system comprises about three times as few joints as a cast-iron main; and thus the unaccounted-for gas amounts only to 2 cub.m. per mètre per annum. It must be remarked that the 22 kilomètres of main were put down in eight weeks. The pipe is simply protected by a coating of tar dressing; and there is no sign of corrosion, even after ten years' service. 2.—As remarked above, the gas in each commune is governed-down to 60 mm. of water pressure. At night, the pressure may rise to as much as 100 mm; but it remains at 50 to 65 mm. from 7 a.m. to 11 p.m. It may happen that some stoppage during the night causes the pressure to rise to 150 mm., when a safety syphon commences to blow. In this case, it is arranged that an electric alarm shall call the station manager to take the necessary action.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Kensal Green Gas-Works.

Some seventy or more members of the Association assembled last Saturday afternoon—under the leadership of the President (Mr. F. A. Frost)—at the Ladbroke Grove entrance to the Kensal Green works of the Gas Light and Coke Company, for a visit of inspection, which was carried out in four parties, who found themselves on a works which were, on all hands, admitted to be excellently ordered, and to contain features of exceptional interest. The guides, who thoroughly explained the many points of interest about the works, were Messrs. A. A. N. Carpenter (the Station Engineer), H. M. Royle (the Chief Assistant Engineer), F. W. Stapleton (the Second Assistant), and E. G. Stewart (now of the Fulham works, but formerly at Kensal Green).

The Association, as a body, had been to these works on two previous occasions; and no doubt a number of those who were present last Saturday took part also in each of the earlier visits. At the time of the first inspection (in 1909) foundations were being put down in the old retort-house for an installation of Woodall-Duckham vertical retorts. The plant was completed during that year; and when next the members were at the works (which was in February, 1912), they were much interested in seeing the plant in operation, and in having its working described to them. Since then, of course, with the wide adoption of the system, full knowledge of its working and advantages has become general. But nevertheless the members, again last Saturday, agreed that their visit was particularly opportune; for once more the principal feature of the inspection proved to be the vertical retort-house, where they were fortunate in being able to see, to closely examine, and to admire, another Woodall-Duckham installation, which was only put to work about a fortnight ago, and which contains all the latest improvements. It comprises two sections of twenty retorts each. The coal, after being unloaded, passes through a coal-breaker, fitted with a jigging screen, and is fed into a gravity bucket conveyor, which conveys it to the tipping tray conveyors, feeding the hoppers. The coal is fed from these storage hoppers into the auxiliary coal hoppers feeding the retorts. The coke is extracted by the special gear fitted at the bottom of the retorts, into a coke-receiving hopper. The coke is discharged every two hours into the coke conveyor fixed under the retorts, and thence on to an inclined conveyor to the coke-storage hoppers. The coke-conveying plant is of the Company's usual standard pattern. The gravity bucket conveyor is also utilized to carry the coke to the coke-receiving hoppers (on the same level as the coal hoppers) for feeding the producers. This is the third vertical installation in No. 1 retort-house. The other two contain respectively two benches of ten retorts each, and two benches of twelve retorts each. The whole of the coal and coke handling machinery in this house is electrically driven. The capacity of the house is 4¾ million c.ft. per day.

It may be mentioned here that there are on the works two retort-houses, each complete with its own exhausting and purification plant; while the gas is separately measured on each stream. Coal is received by barge, and unloaded in the dock by Smith type steam-cranes, with grabs. In the vertical retort house, the coal is carried on a belt conveyor to Nos. 1 and 2 installations, and delivered directly from the crane hopper to the new installation. The second retort-house is filled with inclined retorts; and for this house, the coal is unloaded directly into the crusher. In this house there are 36 settings of inclined retorts, with eight in each setting. The retorts are 24 in. by 14 in.; and 20 ft. long; the capacity of the house being 4½ million c.ft. of gas per day. The coke is carried on conveyors to outside storage hoppers. The efficiency of the coke-handling plant in producing a good article for sale was commented upon; and it was pointed out that this was the Gas Light and Coke Company's standard plant, designed by Mr. Thomas Goulden, their Chief Engineer. All pan refuse on the works is dealt with in washing and screening plants of the Coulson type.

The carburetted water-gas plant, which is of the Humphreys and Glasgow type, consists of six sets—four of them fitted with reversing gear, and two of the old pattern. The total capacity of the water-gas house is 5 million c.ft. of gas per day. The coke is raised in wagons on a hydraulic lift, and conveyed to storage hoppers, from which it is fed to the generators. The blowers are of the usual Sturtevant type, and are driven by Westinghouse steam-engines.

With regard to other portions of the works, it was pointed out that the electric power plant in No. 1 room comprises three 42 KW. generators, and in No. 2 room two 42 KW. generators and one 12 KW.; all being driven by gas-engines direct coupled. The condensing plant is mainly of the atmospheric type, but there is also one unit of Clapham's water-tower condensing plant. All the exhausters are of the Donkin type, and driven by steam-engines. In No. 1 house there are three exhausters, one of 125,000 c.ft. per hour, and the other two of 150,000 c.ft. each capacity; while No. 2 house contains two exhausters each of 200,000 c.ft. per hour capacity. On leaving the exhausters, the gas passes through tar-extractors, which remove the last traces of the tar. Next, in the cyanogen plant, the gas is washed with an alkaline solution of sulphate of iron; and, after the removal of the cyanogen, it passes through tower scrubbers and mechanical washers for the absorption of the ammonia.

In connection with the purification plant, No. 2 house was inspected, and was found to be a very large and well-arranged building, containing no fewer than twenty-four boxes. In No. 1 house there are sixteen boxes. All the vessels are worked on the backward rotation system. In No. 1 house they are 30 ft. by 20 ft., and in No. 2 house 33 ft. square. The former house is used solely for coal gas; while in the latter, twelve boxes are used for coal gas, and the other twelve for carburetted water-gas. Steam is raised for the carburetted water-gas plant by means of four Babcock and Wilcox boilers and one Lancashire type; the other two plants comprise respectively four and three Lancashire boilers. There is on the works a very efficient benzole extraction plant, which has done excellent service. The washing medium is a tar oil; and the plant is arranged so that the oil is continuously debenzolized.

The five station meters on the works are all of the wet type, and of varying size; the largest having a capacity of 250,000 c.ft. of gas per hour. There is a total storage of 11½ million c.ft. of gas; the capacity of the largest holder being 7½ million c.ft. At the time of the visit last week-end it was stated that the make of the works was 12½ million c.ft. of gas per day; but immediately afterwards it was to be raised to 14 millions. The station meets a large and growing demand in the Golder's Green and surrounding district, to which gas is boosted. The area supplied from the Kensal Green works, too, is absolutely free from naphthalene; no complaint from this cause having been registered for years past. All the gas passes through a Botley oil-spraying apparatus at the inlet of the governors, before leaving the works; and, as has just been shown, this has proved itself a highly efficient plant.

The inspection over, the visitors were invited into the men's club-room, there to partake of tea, with Mr. Carpenter in the chair.

The PRESIDENT said they were very much indebted to the Gas Light and Coke Company for the facilities afforded for this visit; and those members who had been able to avail themselves of the privilege had spent a highly instructive afternoon. The principal feature, of course, had been the magnificent installation of vertical retorts. He well remembered visiting the works some years ago, after the first installation had been put into operation. It was evident that since that time a lot had been learned about vertical retorts; and, in the light of this growing knowledge, they saw that the Company were still increasing the number of their installations. There was, without doubt, a remarkable contrast between the atmosphere prevailing in a vertical retort-house and that in a building where the charging and discharging of horizontal retorts was in operation. The very fine coke-handling plant was another interesting feature of the works. The care and thought bestowed upon this indicated that the management placed a great deal of importance on the quality of the coke. It was therefore gratifying to learn that they were able to dispose locally of all the coke they produced on the works. In fact, not only were they able to do this, but he understood that Kensal Green was able to take coke from some of the other stations to supply the demand which existed in the district. This said a great deal for the quality of the coke.

Mr. D. C. CROSS (Lea Bridge), the Senior Vice-President, proposed a hearty vote of thanks to the Gas Light and Coke Company for their kindness in allowing the visit and for their hospitality; and to the gentlemen who had shown them round, and who had done everything in their power to make the afternoon a complete success.

Mr. F. J. PEARCE (Mill Hill) seconded the vote, which was passed by acclamation.

Mr. CARPENTER, in acknowledging the vote, on behalf of the Directors, himself, and staff, said it had been a real pleasure to all of them on the works to meet the members that afternoon. He was glad to know that the new vertical retort installation had proved of interest to them. They had been building it for two years, and had only got it to work a fortnight ago. It had been an anxious time putting up the plant just after the war; and they were very glad to see it at work. With regard to the general question of vertical retorts, it must be remembered that in a residential district, such as was the neighbourhood of Kensal Green, to have a gas-making plant which could be operated without the creation of a lot of smoke, was a great advantage. He believed that, where gas-works were so situated, vertical retorts would enable them to carry on for many years without nuisance, whereas other methods of manufacture might give cause for complaint. Certainly, at Kensal Green the vertical retorts helped them to work without giving trouble to their neighbours. Of the coke-handling plant they were very proud. It was the Company's standard plant, designed by Mr. Thomas Goulden, their Chief Engineer; and it had proved itself very good indeed. This coke-handling plant was quite a feature of the Gas Light and Coke Company's works; and at Kensal Green they had the very latest design. He hoped the Association would come again on some future date, when, perhaps, there might be something else to show them.

On Sunday last, the death took place, at Gloucester Terrace, Hyde Park, of Mr. Herbert Jameson Waterlow, the Deputy-Governor of the Gas Light and Coke Company. Mr. Waterlow, who was in his 76th year, was elected a Director of the Company in July, 1906, upon the resignation of Mr. J. W. Field.

Mr. Norman B. Thompson, son of Mr. J. W. Thompson, the Gas Engineer and Manager at Barnoldswick, Yorkshire, has been appointed Assistant Engineer and Manager at Port Glasgow. Mr. Thompson was previously with West's Gas Improvement Company, Ltd., as supervisor at various works where vertical retorts were being installed. Port Glasgow was the last place where he served in that capacity.

MIDLAND JUNIOR GAS ASSOCIATION.

Mr. C. F. W. RENDLE, of Redditch (the Senior Vice-President), presided at a well-attended meeting of the Association, in the Reading Room of the Council House, Birmingham, last Thursday, when

Mr. F. DAVIES (Assistant Gas Engineer at Walsall) read the following paper.

OBSERVATIONS ON THE PRACTICE OF VERTICAL RETORTS.

I think it is now fairly generally recognized that the ideal system of coal distillation is the one which is carried out in continuous vertical retorts. The process is happily free from all those sources of waste and annoyance usually associated with the retort-house on both horizontal and inclined principles. I am experienced in horizontals, hand and machine charged, with Arrol-Foulis, Fiddes-Aldridge, West scoop, and De Brouwer machines, driven hydraulically, pneumatically, and electrically, and also with modern inclined retorts; and after careful consideration and the weighing-up of *pros* and *cons*, I have not the slightest hesitation in saying that, given careful and intelligent management and a thorough understanding of the peculiar needs of a vertical installation, the results more than justify the expenditure. Of course, I do not go so far as to say that in every case where the increasing of carbonizing plant is contemplated, vertical retorts would be the most profitable investment. Local conditions, and the size of the undertaking, would have to be considered carefully before a decision could be arrived at. It frequently happens that an old retort-house is capable of being modernized, and even the existing benches re-used, modern settings and ironwork installed, stoking machinery employed, and a considerable saving of capital and working expenses effected.

We must also remember the claims of the total gasification and blue water-gas plants in these days of lower calorific values, and the fact that in many of the smaller undertakings the engineer or manager does not always possess the technical knowledge so necessary for the efficient administration of a somewhat complicated system of gas production. Happily, however, this state of affairs has diminished almost to vanishing-point—thanks very largely to the energies of this and other kindred associations throughout the country. Likewise, the engineer of a small undertaking has not, as a rule, a competent staff of mechanics or suitable workshops to deal with the minor repairs and breakdowns which almost inevitably occur on an installation consisting of such a mass of mechanical parts, so that the cost of upkeep may, for this reason, be unduly high, and the efficiency of the plant imperilled by lack of mechanical attention at the right time.

The difficulties which stood in the paths of those doughty engineers who embraced vertical retorts in their early stages were many and serious; and we have to thank those pioneers of industry for the state of perfection to which the system has to-day been brought. An alteration to the shape of retort here, a change in the class of refractory material there, a slight alteration to the method of heating, a careful observation of the behaviour of different grades of fuel, and a general watchfulness for any little alteration in design and method of working which might be of profit to the plant, were points only to be got over by practica experience, lengthy and expensive experiments, and the love to triumph over difficulties which is ever in the heart of the true disciple of Murdoch. All this led to the surmounting of these troubles, and the presenting to the profession of the modern vertical installation, of which both designers and users may be justly proud. Speaking of Murdoch in passing, is it not rather remarkable that his first experiments were carried out in vertical retorts, afterwards inclined, and lastly horizontals?

In order to present a few practical notes on vertical carbonization, I feel that I cannot do better than describe the Walsall installation and methods of working. The retorts were erected by the Woodall-Duckham Company, in part of No. 1 retort-house. This house originally contained horizontal retorts, direct-fired, charged and discharged by hand labour. In 1901, the whole of the house was completely reconstructed and brought up to date. Fourteen beds of eight Ω retorts 22 in. by 16 in. by 20 ft. long were erected and heated by modern regenerative furnaces. The total capacity of the house was 1½ million c.ft. of gas per day; and the retorts were charged and discharged by means of West pneumatic machinery. This plant, after having done excellent work over a period of nearly twenty years, has once more been brought up to date. Seven beds of retorts have been demolished, and half the retort-house carried up to a height of 71 ft. 6 in.

In the reconstructed portion of the house has been erected the vertical installation, consisting of five beds of retorts, four retorts in a bed, each retort capable of carbonizing 5 tons of coal per diem, when under straight coal gas conditions, making the capacity of the plant 1¼ million c.ft. per day. In the designing and setting-out of this installation, every provision has been made in the reconstructed portion of the house for the reception of a further unit of the same size, thus making the capacity of the new house 2½ million c.ft. per day. In the event of the whole of No. 1 retort-house being converted to the vertical system, the productive capacity under the one roof would be 5 million c.ft. per day, as against 1½ millions with the old horizontals—a striking example of the tremendous saving in floor-space effected by the introduction of this system of carbonization.

The plant was designed so as to bring into use the existing coal-breaker, to which was fitted a new bucket-and-chain elevator; the coal being delivered through bottom-discharge wagons, and thence, *via* the elevator breeches shoot, into either of the two longitudinal conveyors (of the push-plate type) which distributes the coal, as required, into the continuous hoppers. The coke-hoppers for feeding the producer furnaces and coking the empty retorts are fed by means of a 30-cwt. lift, which can also be used as an auxiliary method of coal handling, in the event of a breakdown to the elevator or conveyors. The whole of this plant is driven by two 48-H.P. gas-engines working in duplicate, which were part of the old horizontal installation. The coal and coke hoppers are of sufficient size to last for a period of 48 hours with the plant working on full capacity. The existing De Brouwer hot-coke conveyor was retained in connection with the removal of coke from the vertical retorts; but as it has not been necessary to stack large quantities of coke during the period the installation has been working, it has been found to be more economical to transport the coke by hand labour, using specially constructed wooden tipping-carts. In the event, however, of considerable quantities of coke requiring to be put into stock, the De Brouwer conveyor could be brought into use, and the coke from the vertical installation stacked or carried to the carburetted water-gas plant.

THE WALSALL WOODALL-DUCKHAM INSTALLATION.

The Woodall-Duckham installation at Walsall is of the most up-to-date type, and possesses all the improvements which from time to time have taken place in the setting-out and design of the vertical retort plant. The usual platforms, ladders, and gangways have been erected, which make ample provision for the ready inspection of the various parts of the plant and setting. The top gangways give access to the producer-gas and secondary-air flues; while the lower gangway allows for the cleaning of the producer furnaces, also for the inspection of the bottom retort temperatures on the one side and the inlet secondary-air regulation and main waste-gas outlet dampers on the other.

The main waste-gas flue is carried on the opposite side to the clinkering stage, and is supported on a concrete floor carried by rolled-steel channels. This connects with the chimney through the main flue damper. In the building of the setting, a straight joint has been allowed between each four retorts; thus enabling any particular bed in the setting to be started-up or let-down without in any way affecting the neighbouring retorts. The retorts themselves are 25 ft. long, of taper cross-section; and the walls are built of bricks grooved and tongued to prevent leakages. The back of the brick is also panelled out, so that the heat can readily pass through to the charge itself. This ensures a large surface being presented to the heating gas through the flues.

The method of heating adopted in the Woodall-Duckham installation is known as the downward system; the producer gas being admitted through the producer-gas damper at the top of the retort along with the secondary air, through its own damper—the actual flame travelling in a downward direction. Provision has also been made for the lengthening of the flame, in the event of greater bottom heats being required, by the admittance of a further stream of secondary air about half-way down the retort. While fully realizing this is an excellent device in the carbonizing of certain classes of coal, it has not been found necessary to use the auxiliary in the Walsall plant; ample bottom heats being maintained with a single downward flame. The waste gas, before entering the regenerator, ascends to the top of the regenerator by means of a flue constructed in the centre of the setting, and from there downwards through the regenerator and main waste-gas damper into the main flue. In this manner the contra current system of regeneration is maintained, and an exceptionally low temperature arrived at, before the waste gas eventually finds its way to the chimney. One distinct advantage of the Woodall-Duckham system is its simplicity of control. A combustion chamber is provided for either side of each retort, and check tiles have also been provided for each of these combustion chambers. Consequently, the heat of any particular retort is under perfect control.

It has been suggested in certain quarters that, with the downward system of heating, an unsafe maximum temperature has to be carried by the top portion of the retort, in order to maintain adequate temperatures at the base. However palpable this may be in theory, in actual practice this is not the case, ample bottom heats being maintained with the maximum temperature of the retorts not exceeding 2250° to 2300° Fahr. Previously I referred to the second auxiliary air damper, which can always be brought into use in the event of higher bottom temperatures being required. The downward system of heating possesses many distinct advantages, among the foremost being simplicity of control (as previously mentioned), the next most important one being the low cost of upkeep from the repair standpoint.

It is also my experience that, in the event of a charge having a tendency to hang, this as a rule takes place at the first hot portion of the retort. With the Woodall-Duckham installation, the maximum temperature being at the top of the retort, any trouble which may occur due to a hung charge can be at once remedied with a short rod. This is a distinct advantage, which can only be thoroughly appreciated by those who have had experience on an installation where serious carbonization does not take place until the charge has descended about one-third of the length of the retort. The Woodall-Duckham 5-ton retorts are also of ample size for a man to enter; repairs being carried out from the inside.

The improved central coal-feed has also been introduced in the Walsall installation. This permits the rough portion of the charge to fall to the outside of the retort, which not only allows for the easy exit of gas produced, but also has a tendency to allow for the expansion of the charge, which, in a very large measure, prevents hangers.

The producer furnaces are fitted with modern step grates, with a very large grate area. From the time of starting-up to the present, these have given no trouble whatever. The top bars of the grate are entirely closed and effectively sealed against the entrance of primary air by a spreading jet of steam. This prevents the ingress of air up the front wall from the producer; and all tendency to clinker in this region is thus effectively stopped.

There has been no difficulty in obtaining from 17,000 to 18,000 c.ft. of gas per ton, with the calorific value of 450 B.Th.U.—this, of course, under steaming conditions; superheated steam being used at 20 lbs. pressure through a 3-16 in. orifice. Our available coke per ton of coal carbonized works out at 9 cwt.; coke used in steaming, 1¼ cwt.; and coke used on the producer fires, 2½ cwt. The amount of coke dust is not more than ¼ cwt. to the ton of coal carbonized. The yield of tar on the vertical retorts has been 14·9 gallons to the ton; while the yield of ammonia, as sulphate, works out at 31·7 lbs. per ton of coal carbonized. In the Walsall plant, light tar is circulated in the hydraulic main, or first collecting mains. Some considerable trouble has been taken and expense incurred to make this portion of the work successful. An underground tank was constructed having a capacity of about 7500 gallons. Into this tank (which also acts as a separator), the whole of the tar and liquor from the foul main and condensers is run, and from there circulated through the overhead feed tank into the hydraulics. An arrangement has also been made which enables the whole of the contents of this tar-well to be emptied after circulating through the plant. This allows fresh tar to be used for circulating purposes when required. In practice, it is found advantageous to change the tar in this well about every third week in the summer, and about every second week in the winter.

The hydraulic mains are provided with a very simple run-off valve, which, if given proper, careful, and regular attention, is most efficient in preventing pitching troubles. The tar enters the hydraulic main by way of the main gas off-take, at which point it is sprayed on to the ascending gases, which has the effect of bringing down the first heavy tars and any coal dust which may be mechanically carried forward with the gas. During the period the installation has been in use at Walsall, not a single instance of pitching trouble or deposits in gas-mains has been experienced, which happy state of affairs I attribute entirely to the arrangements which have been made in respect to tar circulation.

It was found during the early stages, when the installation was first brought into use, that deposits of ammonium chloride occurred in the neighbourhood of the retort-house governor. It was arranged, in order to overcome this difficulty, that the constant feed of water overflowing from the retort-house governor should be divided into two streams—one passing to the inlet of the governor and the other passing to the outlet. This simple procedure has had the desired effect, and any slight deposits of salts which now occur in this neighbourhood can be removed in about 5 minutes. These salts are of such a nature and consistency as to flow over and readily descend down the tar take-off pipe, and from there to the seal-pot, which is constructed in such a manner as to enable these salts, when troublesome, to be removed.

Regularity of Working Plant.

It is extremely important for the general wellbeing of a vertical installation that each portion of the plant should be worked to the clock; a time being set and adhered to for each of the operations in exactly the same way as one would operate a water-gas plant. In the setting-out of the labour at Walsall, each man was allocated his particular duties; and a timetable was also drawn up for the times at which these various duties should be performed. Such points of attention as the regular poking of the charge, the cleaning of gas off-take pipes, the lubricating and cleaning of coal-valves, a periodical inspection of the heats, both top and bottom, at the commencement and finish of each 8-hour shift, the hourly record being taken of the inlet and outlet pressure of the retort-house governor—this work all being allocated to the retort-house foreman and the top man. The fireman is held responsible for the general cleanliness of the installation, the cleaning of the fires every two hours, and the filling of the producer furnaces; while the bottom men's duties are to withdraw the coke from the bottom coke discharge hoppers every two hours, wheel and stack it in the yard, the inspection every shift of the water supplies to the bottom castings, and the cleaning-out of the water-seal mouthpieces. This work has been so arranged that the whole of these mouthpieces are thoroughly cleaned out once per week, which has been found all that is necessary. In addition to the usual complement of the retort-house men, an engine-driver is employed who is responsible for the working of the gas-engine operating the coal-handling plant, extractor engines, and extractor gear, also for the steam supplies to the retorts, the working of the coal elevator and conveyor, and the operation of the lift. Daily sheets are kept containing records of all the foregoing points, which enable the manager to keep a careful eye upon what goes on in the retort-house, not only at the time he is in the works, but also through the night period.

To facilitate the rapid and accurate administration of the various requirements of the installation, the whole of the retorts have been numbered at each part of the setting which may require adjustment; so that if attention is required to any particular retort at any point within the setting, the number of the retort requiring attention is always in front of the man. Mistakes are therefore, in a very large measure, eliminated and accidents avoided. While this is a very simple and apparently unimportant point, in itself it is of great advantage; and I strongly recommend the practice to anyone having the control of a vertical installation.

The retorts are scurfed once in every five to seven weeks. A scurfing chart is kept which shows at a glance when any particular retort is due for cleaning; so that the scurfing can be arranged to follow a definite order, and the management is always in a position, by referring to this chart, to see exactly which retort should be standing-off for cleaning, and which is the next on turn. This, again, is to be recommended, and although also of a simple character, yet undoubtedly tends towards the efficient administration, and incidentally increases the life of the retort, as neglect of these matters is avoided.

Drying, Lighting Up, and Letting Down.

I am presuming that the installation to be dealt with is a new one, and that the whole of the refractory material requires complete drying. The minimum of time allowed for this work is six weeks; the fire being gradually increased during this period. In the case of a producer furnace fitted with step grates, it is advisable to use in the drying fires temporary bars cut from any old length of flats or angles which may be about the works. It is advisable at this period to see that the water supplies to the producer are complete and in working order, although during the first two weeks of drying no water will be required in the ashpans. It is also necessary to see that the top sight-holes are wide open, and that all flues are clear of broken bricks or other obstruction which might be left from the building of the installation. Fuel must be added in very small quantities, and the fire always kept in a state of incandescence. During the first two or three weeks of the drying, all the dampers on the installation are to remain open, and the furnace doors left ajar. If the primary-air slides are left full open, the aperture will answer for the purpose of inspection. The producer charging door should also be left off, and the hole covered with a piece of steel sheeting, having a hole in the centre about 3 in. diameter. The temporary hole in the front wall of the producer furnaces at this period should be partially closed, leaving an aperture of about 9 sq.in.

After three weeks' drying, it will be found that the steam has ceased issuing from the top sight-holes. If this is not the case, drying should continue until the steam ceases. About this time, the chimney draught should show about 4-10ths on the main flue. Close all sight-holes, leaving the dampers open. This will cause the whole pull of the chimney to be brought to bear on the fire in the producer; thus drawing the heat through the whole of the setting and regenerator. The draught on the chimney will now soon increase to about 5-10ths or more, which is sufficient to ensure the pull on all parts of the setting.

I might mention, at this point, that it is most important that not less than 5-10ths pull be maintained in order to avoid accumulation of explosive mixture and consequent danger to the setting. The secondary-air slide to the regenerator should now be opened very slightly, in order that the steam issuing from this part of the plant should be carried away. During the first five weeks it is advisable to add all the fuel required by the producer furnaces by way of the clinkering door; the fire being piled as high as possible at the back of the furnaces. We should now be in a position to commence gaseous firing. Consequently, all temporary fire-bars must be removed and the regulation drip-plates substituted. It is necessary, however, still to continue the feeding of the furnaces through the clinkering door, removing for this purpose the top drip-plates.

The cooling water must at this stage be brought into use; a small drip being maintained on the last plate, taking care that the supply is constant. Fuel can now be admitted from the storage bunker through the charging door; the level of the fuel being raised gradually until it is about 6 in. below the arch at the bottom of the CO offtake. Producer gas will now be formed and burnt in the crown of the producer; the hot products of combustion going forward into the setting. The temperature at this point must be carefully watched and regulated by the charge of coke—checking the primary-air slides in the clinkering doors, or restricting the temporary secondary air as admitted through the hole in the producer front wall as required. It is advisable that the crown of the producer should never reach a higher temperature than that of a dull red. This adjustment will bring about a long flame, which will proceed up the main CO offtake and along the inlets to the combustion chamber on either side of the retort.

This condition should be maintained for two days, or until such period as the temperature in the top flues, and in the top portion of the retorts themselves, is sufficient to maintain combustion of the fuel gases. When the plant is to be brought into full gaseous firing conditions, before making any attempt to light-up the setting, it is necessary to ascertain the draught on the chimney; making sure that this is sufficient to maintain a good vacuum at the top sight-holes, 5-10ths usually being sufficient at this period. The secondary-air slide to the regenerator may now be opened to (say) 4 in. aperture. Shortly after this has been done, the hole in the front wall of the producer may be bricked up. A rapid inspection of the top of the combustion chamber is at this period

necessary, to ascertain whether the fuel gases are quietly burning. If this is not the case, remove the brickwork in the aperture in the front wall of the producer furnace, and allow the retorts and top flues to get a little hotter, and try once again. This must be repeated as many times as necessary to ensure the safe lighting-up of the setting. The producer may now be gradually filled, still leaving the loose steel plate as a cover to the feeding door until the producer is full and any steam in the fuel has evaporated, after which the cast air-tight cover may be brought into use and the producer kept full.

The setting is now under full gaseous heating, and the heats are to be regulated as necessary by, in the first place, checking the main CO_2 dampers on the regenerator, reducing the primary-air slides at the clinkering door to about $\frac{3}{4}$ in., and checking the secondary air down to 3 in., which must be regulated according to the condition of the flame in the combustion chamber. It is most important at this point to avoid anything approaching short flame conditions, as this is certain to bring about local heating and consequent damage to the retorts. It is advisable that a small quantity of CO be allowed to be visible at the bottom check tiles of the retort. This will not only have the effect of ensuring long flame conditions, but will help materially in heating-up the regenerators. After this stage has been maintained for two or three days, the setting may be balanced-up, and the heats adjusted as required. The adjustment of heats, after once bringing the setting safely through the rather anxious period of drying and first gaseous firing conditions, is a matter of extreme simplicity; and it is not my intention to dwell at any length on this. The regulations of a Woodall-Duckham setting, as previously explained, are simplicity in itself; and given care and a reasonable amount of intelligence, no difficulty should be experienced in maintaining ample heats, and also ensuring economical conditions of working.

To bring the installation from this stage to gas making is also too obvious to require any special description. It is desirable to ascertain the exact conditions of all gas-valves, retort-house governors, tar, liquor, and water supplies to the retorts, careful observation of such things as the chimney draught, inlet and outlet gauges to retort-house governors, also making sure that all the necessary tools required for the working of the installation are on the job, and in the places at which they will be required. It is advisable, however, after the coking of the retort and the drying of the coke, to move the charge about a foot down the retort by means of the extractor, to prove the proper working of the extractor mechanism, and to ascertain that the charge will descend down the retort.

Coal can now be admitted *via* the auxiliary feeding hoppers; the gas-valve at this period remaining shut until such times as a fair quantity of gas is being produced. When this condition has been arrived at, the gas-valves to the particular retorts may be opened, and the pull on the retort-house governor adjusted accordingly. For the first few days of the working it is advisable to mark on the auxiliary hoppers a safety limit, to which mark the indicator may be allowed to reach. In the event of the retort taking coal beyond this mark, it is necessary to knock out the extractor drive. In the drawing of the coke from the coke-hoppers below the extractor, it is also advisable to do this gradually, pinching-off only a small portion of the coke each draw. This will ensure the bottom castings being partially filled with coke, which will prevent a rush of coke, and consequently coal, through the retort, which would no doubt later cause trouble. It will be found after a period of about 20 hours that the newly-made coke will be falling into the coke-hopper. After this period the charge may be completely emptied; and now the desired amount will pass the extractor according to the speed at which it is set to work.

The setting may now be finally adjusted, and the passage of the coke speeded-up according to either conditions of the heat or the description of the coal being carbonized. It will be found that a temperature of 2300° Fahr. can be easily maintained at the top portion of the combustion chamber, with a temperature of about 2000° Fahr. at the base. But in order to maintain this satisfactory condition, it is necessary that the CO flues should be cleaned out at least once a month, and the waste-gas flues about once a year; ample provision having been made in the installation for this operation.

SCURFING.

When a retort has been in action from five to seven weeks, it is usually found that scurfing is necessary. This operation is comparatively simple. It is the practice at Walsall to carry out scurfing operations in pairs, so that one half of a bed can be let-down for this purpose. This makes the heat adjustment extremely simple; the reduction of heat being effected by the main damper regulating that half of the bed and the CO tiles. After the dampers have been placed into scurfing position, it is, of course, necessary to close the coal supply from the storage hoppers to the auxiliary feed hoppers; leaving the charge to descend at its normal speed until about a foot below the cast-iron top mouthpiece. The extractor gear can be thrown out and carbonization continued until such time as the major portion of the gas contained in the charge has been given off. The gas-valve can then be shut and the retort emptied. An occasional turn on the extractor drive by means of hand will hasten the operation of emptying. After arriving at an empty retort, the two small sight-holes in the bottom casting are opened. This will admit of a gentle stream of air, which will be effective in removing the scurf; light scurfing tools only being required at the top of the retort.

The re-coking and setting to work of the retort has been previously explained.

When the vertical installation is required to be completely let-down to cold, the usual precautions taken with horizontal or inclined retorts will be found sufficient to prevent cracking or distortion of brickwork due to too rapid cooling.

It has been my privilege to visit a considerable number of vertical installations in different parts of the country; some of them giving admirable results and others not so satisfactory. But in the majority of installations, I am sorry to relate, little attempt was made to preserve general cleanliness of the plant. This is one of the most important points in the successful administration of a vertical plant.

When the workmen are surrounded by dirt and filth (which very easily accumulates in a vertical retort-house), it can hardly be expected that the work given by the men is as thorough and as careful as would be the case if cleanliness at every point of the installation was insisted upon. It is unfortunately the practice in some works to look upon the retort-house as the grimy side of gas manufacture; but I can assure you that this need not be the case, and that any labour spent in keeping every portion of the plant in spick-and-span order will not only facilitate and expedite any repairs which may from time to time be required, but will be an all-round benefit to the installation.

DISCUSSION.

The PRESIDENT said, as one who used horizontal retorts, he looked with envy upon the excellence of the heat-units to be obtained with verticals.

Mr. E. H. WRIGHT (Wolverhampton) moved a vote of thanks to Mr. Davis for his paper, which was, he said, comprehensive in its scope, and excellent in matter. He would like to know the class of coal used, and some information as to volatile matter and ash; also whether the full five tons was passed through the retorts. Again, was much difficulty experienced with regard to the cleaning-out of the flues? At Wolverhampton, they clinkered every two hours on the settings. He also desired to know whether tests were made of the producer gas before it met the secondary air, and also what was the percentage. As to the yield of tar and ammonia, as far as his own experience went, there had been no increase with the verticals. They were not able at Wolverhampton to test the retorts separately, but hoped to do so very soon. They had not had trouble with regard to ammonium chloride.

Mr. F. S. TOWNEND (Fuel Department, Leeds University) inquired if any control was carried out to see whether each of the individual retorts was getting a full share of steam. The figures for calorific value appeared to be good, though of course this largely depended upon the class of coal used. He thought the presence of the ammonium chloride with the pitch was due to the fact that they came down together from the retorts at a high temperature. He appreciated the fact that an efficient tar-spraying device tended to keep the pitch moving.

Mr. G. C. PEARSON (Windsor Street Works, Birmingham) agreed that simplicity of working was a strong point in the system described in the paper. The control was excellent. Gas making could be stopped quite easily, and started again with facility after a period of rest. The fact that this could be done readily was of great value to them during the coal strike, when a portion of the Windsor Street works plant was closed-down for five weeks, and also on Sunday when there was a suspension of activities. He agreed as to the importance of high top heats. They represented perhaps the best system, as the coal was straight-away raised to a high temperature—thus causing partial carbonization. Regarding steaming, it was necessary to have high bottom heats, and the firm installing the system had been considering whether it would not be well if the method were reversed. He thought they had come to the conclusion that high top heats were essential for mechanical work, and that high bottom heats were also necessary. Arrangements had been made for lengthening the flame. The hanging-up of charges was due principally through charging different coals; each type of coal required a certain speed for the extractor, in order to ensure the most advantageous working. During the war period, they carbonized some of the worst types of coal—very inferior Durham coal; but by separating the coals and keeping a particular kind to certain retorts, and maintaining a constant supply, it was found it could be worked without trouble. The step-grate was an effective device; but it would be better if it were designed for a larger area, because the rate of the passage of air was then very slow. The value of a step-grate lay in the fact that it required very little attention. At Windsor Street, it was necessary to attend to these grates every two hours. This, however, was too often—the area not being sufficient. The quantity of coke in the ashes was excessive. As to the use of superheated steam, he would like to know if Mr. Davis had worked without superheated steam, and whether he found any advantage. There might be an advantage if the steam were wet; but if it were close to the retorts, and there was not much danger of condensation, it was difficult to see what was the advantage of superheated steam. As to the circulation of tar from a tank, he would like to know why it should be necessary to change the tar at the end of every three weeks? How many retorts were there discharging into each seal-pot? In giving a paper on vertical retorts, he thought consideration should be given to waste-heat boilers. This heat was used in the ordinary way for creating a chimney draught. After the capital outlay there was little further expense. The amount of cleaning required on waste-heat boilers was only about the same as on any other boilers; and very little attention was needed. One man could look after a number of such boilers. The cost of producing steam in the waste-heat boilers was only about one-fifth of the cost of steam raised with boilers fired in the ordinary way.

Mr. T. F. E. RHEAD (Chief Chemist, Birmingham Gas Department) raised the question of the naphthalene content of the gas at Walsall.

He also spoke of the desirability of obtaining higher heats lower down the retort while maintaining the top heats as at present, with a view to increasing the efficiency of steaming. This, he remarked, appeared to be limited by the quality and composition of the refractory materials used. Experiments had shown that present-day refractory materials would not stand very high temperatures in contact with steamed charges, as the ash content of the coke seriously attacked the material. He was of the opinion, however, that if a refractory material could be found to withstand these severe conditions, at a reasonable price, even greater efficiencies could be obtained in the steaming of verticals. Alluding to the advantages of continuous verticals, he said that many of the objections to having gas-works in populated areas were removed since their introduction, as these installations were so much cleaner in working.

Mr. W. E. GIFFEN (Windsor Street, Birmingham) agreed as to the great advantage of the bottom heating of verticals, and as to the present liability of the refractories to give-way. Persons other than gas engineers had found similar difficulties; and there had been an attempt to make cyanides by the synthetic method, which was somewhat similar to the procedure employed in the production of coal gas in vertical retorts. The refractory difficulty referred to was not met, and it had yet to be solved. As to the output of residuals—14 gallons of tar to the ton—he would like to know what was the specific gravity of the tar, and was any trouble experienced from emulsion which was absent in the use of the horizontals? Their own experience was that a considerable portion of their tar was of a reasonable gravity, with low water content; but some of it extracted by apparatus such as condensers was so light as to form a kind of emulsion with a high water percentage.

Mr. TOWNEND suggested that the lightness of the tar, of the kind mentioned, was due to the fact that it was low-temperature tar; but he did not think it was essentially a feature of high steaming. It was due, it appeared to him, to the way the operation was carried out, and the nature of the coal used.

The PRESIDENT said the value of being able to shut-down at week-ends, and to restart without difficulty, was emphasized in these days of extra wages for Sunday work. He looked with envy upon the vertical retort in relation to the ease of control, and the facility for altering the speed of the throughput. He agreed that no paper on verticals was complete without reference to waste-heat boilers. They ought to be in far greater use on gas-works than they were.

Mr. DAVIS, in replying on some of the points raised in the discussion, said at Walsall they were not putting more than 3 tons 18 cwt. of coal through the 5-ton retort under steaming conditions. He intended to try the method of clinkering every four hours. He agreed that clinkering every two hours was extravagant. No analysis of the producer gas had been made; but such analyses would vary because of the difference in coal quality, and with variation in steaming. The inerts were about 18 p.ct. (CO_2 and N_2).

SOCIETY OF CHEMICAL INDUSTRY.

London Section.

There was a meeting on Monday evening of last week, in Burlington House, of the London Section of the Society of Chemical Industry, under the Chairmanship of Mr. E. V. EVANS, of the South Metropolitan Gas Company.

Forthcoming Meetings.

The CHAIRMAN, in opening the proceedings, gave the members a few particulars with regard to the work of the Society. He said that, owing to prevailing conditions, it was a small party who went to Canada for the annual meeting; but those who did go were very warmly received. The Overseas Sections were really strong constituents of the main body. It would appear that for a Colonial to be a member of the Society of Chemical Industry, gave him a connecting-link with the Mother Country. They were assured that quite a number of Canadians intended to come over here for the next annual meeting of the Society, which would be held in Glasgow during July. The London Section had a very good programme for the coming winter session. For one thing, the Society had joined with the Institution of Mechanical Engineers, and would have a paper—he believed it would be read on Jan. 6—by Mr. G. M. Gill, the Chief Engineer to the South Metropolitan Gas Company. The subject chosen was one which would prove of great interest, not only to engineers, but also to chemists. It had also been suggested that the question of smoke abatement would form a good topic for a joint conference with the chemical engineering group.

A Comparison between Laboratory Fuel Tests and Practical Working Results of the Producer Gas Process.

Mr. N. E. RAMBUSH, in a paper which he presented to the Section earlier this year [see "JOURNAL" for May 11, p. 331], dealt with thermal losses in gas producers. On that occasion, he stated that the greatest cause for thermal loss is generally the amount of heat which is carried away by the hot gases from the producer. This loss is practically absent with hot-gas producers (where the gas is not cooled); but for an average English coal, the sensible heat loss represents: Hot gas producer (if cooled), 17 p.ct.; cold-gas producer (without recovery), 14·2 p.ct.; ordinary Mond type of bye-product producer, 16·4 p.ct.

In compliance with a wish that had been expressed, he last week read another paper in which he explained in great detail the method adopted by him in making distillation tests of fuel for gas-producers, and made a comparison between these laboratory tests and practical working results. He said that, by conducting a proper and thorough laboratory investigation of the behaviour of fuels under a distillation test, it was possible to predict the thermal efficiency, the tar yield, and the ammonia recovery that can be obtained in practice. He claimed that the user could determine by his method how much heat would be retained in the gas as potential heat, what would be the heating value of the gas, what quantity of bye-products it would be possible to recover, and what sort of plant would be required to deal with any particular type of fuel. The fuel to be tested is broken into pieces of a size between ¼ in. and ½ in., and 2 kg. remains in the retort from four to six hours; the temperature reached being 800° C. He showed on the screen the various figures in the form of a weight balance-sheet and a thermal balance-sheet. The retort in which the fuel is heated in the test apparatus was referred to by several of the speakers who took part in the long discussion which followed the reading of the paper.

Dr. HAROLD G. COLMAN said he agreed with a statement made by the author that the ordinary volatile matter test was of no use when one wanted to know what yield of tar would be obtained from a coal, either by carbonization in retorts or by gasification in producers. But by distilling the coal in a retort, as the author did, one did not get the same tar as in a producer. It seemed to him that, if they could arrange a producer type of test for determining the tar, it would be an advantage to those interested in gas-producers.

Dr. R. LESSING said he was in accord with the previous speaker that the atmosphere in which the heating of the coal was carried out was of the greatest importance. He referred to the very valuable work that had been done during the last few years on the steaming of coal in retorts. By this the kind of product, quite apart from the quantity, had been considerably altered.

Mr. A. LYMN said Dr. Colman had suggested that producer gas should be used for the test. This would be quite right, provided it was made from coke, and not from coal. He thought the making of a carbon balance-sheet would be a good idea. When such a balance-sheet was made, there was a loss shown of from 10 to 13 p.ct.; and it had not yet been possible to find out where this loss arose. It would be interesting if someone could tell them why they had this carbon loss, and to see whether the carbon balance-sheet would go hand in hand with the heat balance-sheet.

Mr. W. H. PATCHELL said the fusibility of ash was a very important matter, which had not received the attention it deserved.

Mr. H. HOLLINGS, as having been associated with Prof. Cobb in much of his work, discussed some of the figures that had been quoted by the author.

COKE FOR BLAST-FURNACES.

Mr. R. H. Archer Coulson, of the Skinningrove Iron Company, Ltd., in his Presidential Address to the Cleveland Institution of Engineers, at Middlesbrough, on Monday, the 7th inst., said that the value of coke in relation to heat reactions in blast-furnaces was determined, not only by its carbon content, but even more by its size, its physical properties, its chemical composition, and the interior and surface structure of the pieces. These properties were, in turn, influenced by the chemical and physical properties of the coals used in coking, the density of the cake of coal in the oven, the coking time, the temperature, and the heat regulation of the ovens, and the methods of quenching, screening, and handling the finished coke.

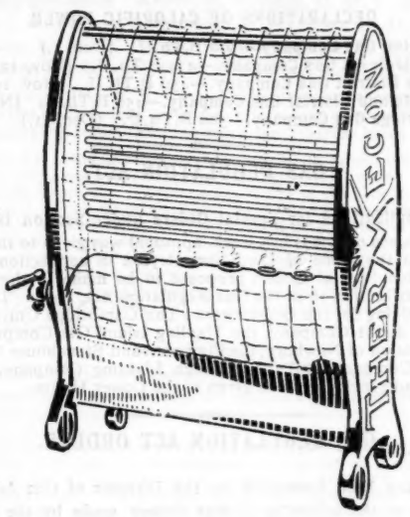
What principally concerned the blast-furnace, other than the chemical constituents, was the rate of progression of the combustion, which depended not so much on chemical analysis as on the physical properties of the coke. Combustibility was really the speed at which the carbon molecules in the coke combined with oxygen under given conditions. What must be aimed at was a coke which would burn rapidly and with intensity at the tuyeres, yet which was sufficiently strong and hard of surface to resist abrasion and crushing in the furnace. When combustion was slow, it extended too high up the furnace; and in this way the ratio of direct reduction by carbon to indirect reduction by the gases was increased, and large heat losses and high top temperatures were the result.

The quality of coke was influenced greatly by the conditions of coking and quenching. Next to proper quenching, an efficient method of handling and screening the coke enhanced its value for blast-furnace use. The size should be kept within certain limits, determined by experience, for each kind of coke and for existing furnace conditions; and having established this size, it should be kept uniform. The combustibility of coke was greatly altered by a change in size; and uniform results could not be expected if it varied from day to day.

The greatest difficulty which confronted the producer, as well as the consumer, was the lack of, not only a thorough understanding of the kind of coke needed to best suit furnace conditions, but also of practical coke tests which might reveal those physical properties of the coke which were so vital to furnace practice. Very considerable economy might result from a more careful chemical and physical control of coke-ovens. At those places where coke-ovens were installed as a unit of iron and steel works, particular attention should be paid to such details as excessive moisture in the coal, on account of additional heat required to evaporate the water, resulting in a reduction of the quantity of spare gas.

THE "THERMECON" HEATER.

THE portable gas-heater illustrated is being marketed by Messrs. J. & W. B. Smith, Ltd., of Farringdon Road, E.C. As will be noted, there are a number of small tubes placed horizontally above the burners; and these are made of "Vitreosil." The



stove has a nickel-plated body, copper base, and brass-wire guard. It is substantially made, and is provided with a flexible-tube cock, so that it can be easily connected and disconnected for moving from place to place as desired.

Water-Gas Tar as a Wood Preservative.

It would seem that there are four fundamental qualities that affect the value of any material for its use as a wood preservative. These are penetrance, or the ability to get the material into the wood; permanence, or its ability to stay in the wood; water-proofing effect; and toxicity. As a result of practical experience, stated Mr. W. H. Fulweiler, in a paper presented some time ago to the American Wood Preservers' Association, it has been found that water-gas tar derivatives—whether refined tar, distillates, or mixtures—appear to give very satisfactory penetration. In fact, it is possible to secure very complete penetration of wood blocks with refined water-gas tar having a specific gravity of 1·14 and a viscosity as high as 2·4 at 100° C. The permanency of the material in the wood will probably be affected by three factors—evaporation of the material, leeching, and changes in chemical composition. It is to be expected that the loss in evaporation which depends upon vapour tension would be slightly lower with water-gas tar oil than with coal-tar oils of the same gravity; and laboratory tests have in general confirmed this. Practical experience with authenticated samples of water-gas tar have shown that, for instance, in wood blocks, no decay has taken place in twelve years, and in railroad ties no decay has occurred in ten years.

Water Gas Scrubbing and Condensing Apparatus.

By means of an inquiry, some information has been gathered on the subject of scrubbing and water-cooling systems used in connection with water-gas plants in the United States; and the results were embodied in a paper presented by Mr. R. A. M'Neas, of San Antonio (Texas), at the annual convention of the Pacific Coast Gas Association. Admitting that the answers were few, and the information fragmentary, the author said the number of cubic feet of scrubber content per 1000 c.ft. of gas per 24 hours, seems to vary all the way from less than 1 c.ft. to more than 3 c.ft. It appears that 2 c.ft. of scrubber content for each 1000 c.ft. of water gas per 24 hours is ample. Small plants with large relief holders may reduce this; while large plants with comparatively small relief holders may find it necessary to increase the figure named. The matter of the circulating water, with its necessary evils of tar settling and cooling should receive the consideration of the gas man. The best practice is the use of the same water over and over again; and therefore it is necessary to separate the tar from the water, and cool the water. The best method of separation, and the most suitable temperature for the separation, are rather indefinite. The most satisfactory results seem to be obtained when the mixture is brought to 140° to 160° Fahr., and allowed to stand and cool. It would, said Mr. M'Neas, appear that condensing and cooling systems should operate so as to cool the gas as slowly as possible, but at the same time sufficiently quickly that the condensate and gas will not be in contact too long. To this end, some investigation needs to be carried out to determine the relative importance of the amounts of water used per 1000 c.ft. of gas and the scrubber capacity, as well as the temperature drop, that will secure the greatest efficiency.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Continuous Gas Sampling and Continuous Calorimeter Tests.

SIR,—In the opening paragraph of the article which you kindly published from me last week, I made the suggestion that continuous sampling of gas should be adopted not only as an ordinary practice for calorimeter tests, analysis, and specific gravity determinations, but for calorimeter tests under the Gas Regulation Act until a recording calorimeter is produced that meets with the requirements of the Gas Referees.

Of course, I appreciate that there would be limitations to this, as the official examiner would not in the case of numerous works be testing every day, but intermittently. I hold, however, that a sample of gas representing that sent out from the works over (say) twenty-four hours is the correct thing for even works' tests; and where continuous sampling is the process followed for this purpose, the current sample would always be available for the official examiner when he puts in an appearance. This would be more satisfactory than spot-testing from the testing authority's point of view, as it would be to the supplying undertaking, as there could be no suggestion then that the "spot" tests were unduly in favour of the gas suppliers, or unduly low, and so against them.

While writing, I might mention an error (for which I take the responsibility) which occurred in the fourth line from the bottom of the first column of the article on the subject in last week's issue. "The gas-inlet valve G is left open" should read: "The water-outlet valve G is left open."

B. P. BEZANT.

Gas-Works, Dartford, Nov. 10, 1921.

Expert Investigation of Tully Plant and Gas.

SIR,—You suggest in the concluding paragraph of your editorial on Mr. M'Donald's address to the Scottish Junior Gas Association that thorough expert exploration of the Tully plant by the Gas Investigation Committee of the Institution and Leeds University is badly wanted. Nothing would give me greater pleasure than if such exhaustive tests could be arranged for the benefit of the industry; and I should personally be happy to give all assistance in my power.

It may, however, be found that the present moment is slightly premature, particularly in view of certain recent developments, the results of which are now being incorporated in the plants which we have at present under construction.

I am satisfied in my own mind that finality has not yet been reached in this very intricate problem; and for this reason it may be found that we have to content ourselves meanwhile with the satisfaction given by our plants to individual engineers and the consuming public.

C. B. TULLY.

Newark, Nov. 10, 1921.

Cheaper London Gas and a Notable Centenary.

SIR,—On reading in the daily press that the Wandsworth Company were to reduce their price of gas by 1d. per therm for the whole of their area in South-West London, with an addition of two-fifths of a penny for the Wimbledon and Epsom districts, from the meter readings at Christmas next, one calls to mind that this is on a par with the up-to-date ideas of the Company, at the head of which is Mr. H. E. Jones, noted for his "go-ahead" methods of cheapening and popularizing gas. No doubt his action will set the pace for the Metropolitan Companies (his Company is not one of thirteen Metropolitan Gas Companies as set out in the Metropolitan Gas Act, 1860, but one of the nine outside for the purpose of the Act)—indeed, since reading this announcement, I note that the Gas Light and Coke Company have followed with a similar reduction to their consumers North of the Thames.

It is rather a remarkable coincidence that I had before me a day or two since a copy of a handbill, setting forth the price of gas, issued by the Wandsworth Company in 1821—just a century since. It is of sufficient interest to warrant quoting it, as showing that the Company were well to the fore one hundred years ago.

Wandsworth Company, 1821. Gas 10s. per 1000 c ft.

No. 1 argand, burning dusk till 9 p.m.	£2 10 0
" " " " 10 "	2 16 0
" " " " 11 "	3 4 0
" " " all night	4 8 0
If burnt on Sundays, one-sixth extra.	
One jet for hall or passages, 4-in. flame	1 10 0

The Bodmin Company had a similar scale, with gas at the same price; but they allowed an extra hour on Saturday nights. The payment was quarterly in advance; and there was a reduction of 2s. on £2 2s. lights, on taking four lights or upwards.

Among some of the conditions at that date were the following: "The flame not to exceed 5 in. in height." "Any person found using the gas after the hour contracted for, will be charged up to the following hour for that quarter." As this was before the days of meters, the task of the Company's inspectors was no easy matter; for they had to be out after lighting-up-time watching the shadows on the blinds, to note if the flames were too high, or if the time for extinguishing was exceeded. Thus arose the term "rental" and "rental department." The historian of that date says: "Every person must have noticed how shamefully many disregarded the terms . . . some by means of excessive flames . . . others by suffering the lights to burn beyond the proper hours."

Fortunately for the Wandsworth Company it has for its Chief Mr. H. E. Jones—a live man, and one of the few who, during the period of "somnolence," "inertia," and "reposeful ease" that set in, in the early eighties, following a long period of agitation, conflict, and trouble, extending over 28 years of arranged areas, fierce competition,

amalgamations, and statutory monopoly, kept the torch burning brightly (while with the Commercial Company), along with Dr. Thomas Newbigging in the North, Mr. Chas. Hunt in the Midlands, the two Liveseys in the South, seconded by Sir (then Mr.) Corbet Woodall, D.Sc., the able Engineer of the Phœnix Company, as set out in the "Centenary of Gas Lighting."

It would be interesting if any other companies have any leaflets in their possession, so that they might be rescued from obscurity, in view of the many undertakings which will, in the next few years, celebrate their centenary. I should be glad to have a copy of any of these.

W. J. LIBERTY.

55, *Beckwith Road, North Dulwich, S.E.*,
Nov. 3, 1921.

The Simplex Water-Gas Plant.

SIR,—Regarding your editorial note, "The Way of Economy for Small Works," in the "JOURNAL" for Nov. 2, in which the "Simplex" water-gas plant is discussed, mention is made that insufficient information is given to ascertain the overall efficiency of the plant. We have, therefore, much pleasure in submitting further details for the benefit of your readers.

The steam consumption for the actual making of gas is approximately 25 lbs. per 1000 c.ft. of gas made at a pressure of 40 lbs. and upwards. The steam required for enriching the gas is extremely small, as only just sufficient steam is used to atomize the tar in the carburetter. This amounts to only 3 lbs. per 1000 c.ft., while the tar required varies between 1 and 2 gallons per 1000 c.ft.

Regarding the fan, this can be driven from any existing countershaft, and absorbs only 2 B.H.P.

The figures quoted in the "JOURNAL"—53,800 c.ft. of 340 B.Th.U. gas, giving a gasification efficiency of 71 p.ct.—hardly do justice to the plant, as they were obtained from a three days' test in which the plant was shut-down for eight hours each night; the coke consumption during the nights being included in the coke consumption for gas making.

Working the plant continuously, we have no difficulty in obtaining over 65,000 c.ft. of 340 B.Th.U. gas per ton of coke; and, assuming the calorific value of the latter to be 11,300 B.Th.U., this gives an efficiency of over 85 p.ct.

The total steam required per ton of coke gasified is 1820 lbs., being equivalent to the consumption of 17·6 therms or 153·07 lbs. of fuel at 11,500 B.Th.U. per pound. And deducting this from the gasification efficiency of the plant, we are left with nearly 79 p.ct.

By the adoption of the "Sydenham" grate, the labour costs are reduced to a minimum, as clinkering is absolutely eliminated, and, moreover, a considerable amount of breeze, which may be profitably burnt in the boilers, is recoverable from the ashes. This has not been taken into consideration.

By the admission of blue gas to the foul main of the coal gas plant, naphthalene troubles on the district are greatly reduced.

ED. LINSLEY, Managing Director,
Vertical Gas-Retort Syndicate, Ltd.

17, *Victoria Street, S.W., Nov* 14, 1921.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade under section 1 of the Gas Regulation Act.

Barnet District Gas and Water Company.

The maximum prices per therm proposed by the undertakers in substitution for the present maximum prices of 4s. 6d., 4s. 3d., and 4s. per 1000 c.ft., under section 42 of the Barnet District Gas and Water Act, 1872, are 18·4d., 17·8d., and 17·2d. per therm; and it is proposed that under this section 0·6d. per therm shall be substituted for 3d. per 1000 c.ft., and in substitution for the present maximum price of 6s. under section 43, Barnet District Gas and Water Act, 1872, 22d. per therm, and in substitution for the present maximum price of 4s. 6d. under section 72, Barnet District Gas and Water Act, 1883, 18·4d. per therm. It is proposed that, under section 72 of the Barnet District Gas and Water Act, 1883, 49s. per ton shall be substituted for 16s. 3d. per ton, and 0·6d. per therm shall be substituted for 3d. per 1000 c.ft.

Llynvi Valley Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 8s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. per therm.

New Hedon Gas and Coke Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. 1d. per therm.

Tavistock Lighting, Coal, and Coke Company, Ltd.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 9d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8·17d. per therm.

Tonbridge Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are as follows: (*a*) Within the limits of supply as defined by the Tonbridge Gas Act, 1872, 3s. 9d. per 1000 c.ft.; (*b*) beyond these limits, 4s. 6d. The prices which they have asked the Board of Trade to substitute for these are: (*a*) Within the limits as defined by the Tonbridge Gas Act, 1872, 16·3d. per therm; (*b*) beyond these limits, 18d. per therm.

SPECIAL ORDER.

Hexham Gas Company.

Application is to be made by the Company to the Board of Trade for a Special Order to enable them to raise more money; to alter the existing sliding-scale of price and dividend; to regulate the supply of gas; and for other purposes.

DECLARATIONS OF CALORIFIC POWER.

Bridlington Gas Company.—500 B.Th.U. (Dec. 1.)
North Middlesex Gas Company.—450 B.Th.U. (Nov. 12.)
Riddings District Gas Company.—450 B.Th.U. (Nov. 19)
Southgate and District Gas Company.—450 B.Th.U. (Nov. 12)
Stocksbridge Gas Company.—500 B.Th.U. (Dec. 31.)

GAS REGULATION ACT.

Applications for Special Orders under Section 10.

In the House of Lords last week, approval was given to the motions standing in the name of Lord Somerleyton in connection with the drafts of five Special Orders proposed to be made to the Board of Trade under section 10 of the Gas Regulation Act, 1920. The undertakings applying for the Orders were: The Cambridge University and Town Gas Light Company, the Hayling Island Gas Company, Ltd., the Corporation of Newbury, the Plymouth and Stonehouse Gas Light and Coke Company, and the Wisbech Lighting Company. Similar approval had previously been given in the Lower House.

GAS REGULATION ACT ORDERS.

There have been forwarded by the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Bridlington Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 14d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-two-thirds. (Nov. 7.)

Southgate and District Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17 8d. per therm.

As from the declared date, the word "therm" shall be substituted for "1000 c.ft." wherever it occurs in section 28 (limit of charge for public lamps) of the Colney Hatch Gas Act, 1876; and "10,000 therms" shall be substituted for "2 million c.ft." in that section.

As from the declared date, "0·1d. per therm" shall be substituted for "$\frac{1}{8}$d. per 1000 c.ft." in section 3 (power to establish a benefit fund) of the Southgate and District Gas Act, 1912. (Nov. 7.)

South Shields Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 14·4d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, "0·8d. per therm" shall be substituted for "4d. per 1000 c.ft." in section 48 (as to price of gas in South Shields rural district) of the South Shields Gas Act, 1904.

Prepayment meter clauses are included. (Nov. 7)

War Memorial Unveiled at Cardiff.

Mr. C. E. Dovey (the Chairman) unveiled on Thursday last, at the Bute Terrace works, a memorial tablet to the eighteen members of the headquarters staff of the Cardiff Gas Light Company who fell in action during the war. He said the Company's staff in 1914 numbered 663, of whom 352 were eligible for service and 271 joined-up, representing the excellent percentage of 77. Eighteen of the men were killed in action, and many others won distinctions—including Lieutenant Barter, who gained the V.C. and M.C. While the men were away, the Company looked after their wives and families by making considerable grants. The Company had now obtained parliamentary powers to re-introduce their co-partnership scheme, which they hoped would be of great advantage to all. Ex-Sergeant D. W. Price expressed appreciation of the generous manner in which the Company had dealt with the men and their wives and dependants during the war. On the motion of ex-Sergeant A. G. Barry, seconded by ex-Sergeant-Major J. B. James, a vote of thanks was passed to the Chairman and Directors for the interest they had shown in the memorial. It is a handsome brass tablet bearing the names of the dead, and mounted on a marble panel in the wall of the workyard.

Canadian Gas Inspection Service.—The report for the year to March last of Mr. O. Higman, Director of Electricity and Gas Inspection Services, of the Canadian Department of Trade and Commerce, gives particulars of the coal and water gas companies registered, and the tests of gas and of meters made. Sulphuretted hydrogen and calorimetric tests of the gas are carried out. The number of meters in use by each undertaking is given. There are also lists of natural gas companies and acetylene gas companies registered, with the numbers of meters in service.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Twenty-Fourth Annual Meeting of the Association was held last Wednesday, at Caxton Hall, Caxton Street, Westminster, under the chairmanship of Dr. CHARLES CARPENTER. The register of attendance showed that the membership was represented on the occasion by the following gentlemen: Messrs. H. E. Jones, G. M. S. Iorns, T. H. Hazell, E. J. K. Fussell, J. Paterson, R. W. Edwards, D. H. Helps, C. F. Botley, C. M. D. Belton, William Phillips, R. B. Anderson, George Clarry, W. A. Scott, H. T. Manwaring, and G. Stevenson.

The SECRETARY (Mr. F. E. Cooper) read the annual report, and the minutes of the last meeting. He also referred to letters of regret, and read the following communication from Mr. Charles Hunt:

Dear Sir,—As, to my great regret, I am unable to attend the meeting on Wednesday, allow me to say that I greatly appreciate the kind intention of the Committee to propose my re-election as one of the Vice-Presidents. I do so, however, not on my own account, seeing that I have never taken part in the work of the Association, as I do value it as a reminder of the very long connection of my Company with the Association and of the days when we of that Company were followers of Sir George Livesey in his efforts to secure freedom for the gas industry.

Let me add that I heartily congratulate the Committee on what has recently been done in this direction, and cordially wish them continued success.—Yours faithfully,

CHARLES HUNT.

ANNUAL REPORT.

The annual report of the Committee was as follows:

The Committee herewith present the revenue account and balance-sheet, together with a report of the proceedings of the Association for the year ended Sept. 30, 1921.

The ascertained expenditure amounted to £893 0s. 8d. The revenue was: Subscriptions £454 13s., income-tax refunded £34 11s. 6d., interest on war loan £195 1s. 6d., amounting together to £684 6s., leaving a deficit for the year of £208 14s. 8d. From the balance-sheet, it will be seen that the assets amount to £4409 15s. 7d., consisting of £4636 10s. 5d. 5 p.ct. War Loan, 1927-1947, at cost £4404 14s. 5d., and cash in hand £5 1s. 2d. From this total must be deducted the amounts owing to the bankers—namely, temporary loan £2925 and £300 11s. 7d. overdraft on current account, amounting together to £3225 11s. 7d.

At the request of the Home Office the Executive Committee considered the draft regulations proposed to be made under the Factory and Workshops Act, 1901, and were of opinion that in many respects they would unduly and unnecessarily restrict certain operations in connection with gas manufacture. Objections were accordingly prepared and forwarded to the Home Office with the object of securing that the proposed regulations should not apply to gas-works except in so far as chemical manufactures were concerned, and that as regards sulphate of ammonia the regulations should only apply to such portions of the works where the same was made, that they should not apply to tar dehydrating plants, and that the concentration of liquor should be excluded. Though the proposed amendments were not accepted in their entirety, it is satisfactory to be able to report that the regulations were very considerably modified in the directions sought.

On the appointment by the Board of Trade pursuant to section 2 (4) of the Gas Regulation Act, 1920, of Committees to consider the question of limiting the proportion of Carbon Monoxide and Incombustible Constituents in gas, the Chairman, at the request of the Executive Committee, agreed to place the views of the Association before the said Committees. With the object of giving the Chairman every possible assistance, a circular letter was issued to members inviting their views on the two questions to be inquired into by the Board of Trade, with the result that many valuable opinions and a mass of information were obtained. Proofs of the evidence which the Chairman proposed to give before the said two Committees were read at a meeting of the Committee of the Association specially convened for the purpose, at which both proofs were approved. In due course the Chairman gave evidence before the two Committees, who have since issued their reports. The Carbon Monoxide Committee reported with certain minor reservations: "That it is not necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which may be supplied in gas used for domestic purposes." The Committee on Incombustible Constituents in Gas recommended: "That at present no limitation be placed on the proportion of incombustible constituents in town gas, and that after a period of three years, when the therm basis of charging for gas delivered has become general throughout the United Kingdom, and the difficulties under which some gas undertakings now labour are likely to have become mitigated, a further inquiry be instituted into the question comprised within our terms of reference."

The Committee consider that both reports are very satisfactory, and that the evidence the Chairman gave before the Committees was of the greatest value. If a further Committee be appointed to consider the question of Incombustible Constituents in Gas, the Committee will take such action with reference thereto as they may consider desirable in the interests of gas companies.

The Income-Tax Sub-Committee of the Association had under consideration the question of making representations to the Board of Inland Revenue for the continuation for a further period of the increased allowance for depreciation of gasholders, meters, and stoves; but in view of the instruction given by the Board to Inspectors of Taxes—that they had a discretion to allow such depreciation in suitable cases—it was not considered advisable to proceed in the matter.

The question of the exemption of certain classes of gas companies' employees from the operation of the Unemployment Insurance Act, 1920, was considered by the Committee. The Committee came to the conclusion that it was undesirable that companies should apply for exemption; and a circular letter to that effect was sent to members of the Association.

Among other matters which the Committee have had under consideration were: The Electricity Supply Bill, re-introduced into the House of Commons; the proposal of the National Union of Manufacturers (Incorporated) to fix an Internal Bank Rate; the conference on local rates, convened by the London Municipal Society for the Promotion of Municipal Reform (at which the Association was represented by specially nominated members); the Schedules prepared by the Board of Trade Census of Production Department (submitted to the Association for their observations); and the proposal of the Board of Inland Revenue that the Association should pay income-tax on its surplus revenue for each year, and that income-tax should not be paid on subscriptions, which has been referred to the Income-Tax Sub-Committee.

In May last, the Secretary was requested to write to the Prime Minister, in the name of the Association, expressing its keen satisfaction with the policy of the Government with reference to the miners' strike, as expressed by him in his speech at Maidstone. In acknowledging receipt of the letter, the Prime Minister, through his Secretary, expressed his satisfaction that the Association appreciated the Government's efforts to bring about industrial peace.

In addition to considerable correspondence with members on the matters dealt with above, the Secretary has, as in past years, given advice to members, both personally and by letter, on a variety of subjects of interest and concern to Gas Companies, including the following: Points arising on the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, the Gas Regulation Act, 1920, the Public Utility Companies (Capital Issues) Act, 1920, the Unemployment Insurance Act, 1920, and the Unemployment Insurance (No. 2) Act, 1921; Corporation Profits Tax; hire of prepayment meters; raising price of gas by non-statutory gas company; extension by corporation of its electrical area of supply; company consumer in liquidation, distress for gas account; laying of electric cable, prevention of electrolysis; income-tax depreciation; coin-meter collection receipts; damage to lamp-post by motor coach; damage to gas apparatus by steam-roller; payment of back-dividends by sliding-scale company; public lighting agreements; accident through failure of clock-controlled apparatus; damage to coin-meters and stealing cash therefrom; destruction of coin-meter by fire; issuing shares at a discount; form of gas company's accounts; payment of interest on debentures and dividends on preference shares free of income-tax; increased rate of interest on capital to be borrowed; supply of electricity for lighting by power company; recovery of Statute-barred gas account; claim for reduction of rates owing to closing-down of gas-works; advantages of statutory powers; writing-off value of disused, but usable, plant.

The following members retire from the Committee in accordance with Rule 12: Mr. R. W. Edwards, Mr. R. Bruce Anderson, Mr. George Andrews, Mr. George Clarry, Mr. T. H. Hazell, and Mr. Douglas H. Helps, all of whom offer themselves for re-election.

AN APPEAL TO GAS COMPANIES.

The CHAIRMAN said he had now to propose that the annual report and accounts be received, and, if approved, adopted. He could not help thinking, when he heard the minute read out of the meeting a year ago, how appropriate it would be as a record of to-day's proceedings. In the first place, they had Mr. Jones, with his unrivalled experience, pointing out the great advantages of the Association, and expressing regret that, although the subscription was in most cases in the region of a nominal one, they did not register on their books every gas company in the country. He especially deplored this, having regard to the constitution of this Association, and the fact that it was entrusted with a special duty, which he (Dr. Carpenter) did not think could be, or was likely to be, performed so well by any other organization—viz., the protection of the rights and privileges of those people who had invested money in gas undertakings (the shareholders) as distinct from any other body of people interested in gas supply in the kingdom. Considering that the function of the Association was care and watchfulness—the exercise of a very complete watchfulness—over all matters, especially legislative ones, appertaining to gas companies, it was unfortunate that the Association was not able to say that a larger proportion of gas companies belonged to it; and it was particularly unfortunate when they looked back at the past, and remembered that the organization had been in existence for 25 years. He did not think anyone could say it had not fulfilled thoroughly and completely the objects for which it was founded all that time ago. The Association had had the privilege of having had two of the leading men of their day at the head of its affairs. Sir George Livesey was for many years their Chairman. No one would deny for a moment the premier position he occupied at the time of his activities, nor would anyone deny that position was to-day admirably filled by Mr. H. E. Jones, who occupied one in the industry absolutely comparable with that held by Sir George. However, they were face to face with the fact, despite their remarkably good historical record, that they were still pleading for a greater interest in their affairs on the part of gas companies generally, representing the gas shareholding public.

THE ASSOCIATION'S RECORD.

If they looked back for a moment, and cast their eyes on what the Association had really done for the industry during this period of nearly 25 years, everybody must agree that the record was a notable one. Their Secretary had been good enough to jot down for another purpose the details of the story; and it was remarkable how one was reminded by them of matters which were accepted to-day as ordinary and established. When they looked back, they found the Association played a very important part in getting important changes brought about. One of the early questions had reference to municipal trading. It also appeared that it was something like 25 years ago (though he had forgotten it was so long as that) that the Association was the champion of the gas industry with respect to the scare of arsenic in coke. The Association then championed the rights of gas undertakings, and exceedingly effectively. Then a new state of affairs, it would be remembered, came about with regard to the tendency of electric undertakings, run by municipalities, to sell their current at a loss, and make up deficiencies out of the rates. The well-known Northumberland clause was adopted very largely, owing to the advocacy of the Association. Passing over some more or less important matters, they came to the removal of the sulphur restrictions. Whatever views one might have with regard to the details of that particular problem, everyone connected with gas undertakings, or responsible for their working, must feel that an enormous weight was taken off their shoulders when compulsory lime purification was abolished by this action. This, he need not remind the members, was wholly initiated, and carried successfully through, by the Association. Then he thought that, after all that had previously been done, the most remarkable piece of work was with reference to the adoption of the standard burner, which gave to gas its proper value. Through that, it would be recollected, the Association was the means of providing the whole of the gas industry with a new charter, as a result of the initial adoption of the new burner in the London area. If one had to justify the existence of the Association, he thought one would be warranted in pointing to that, and saying: "If we as an Association can do that sort of thing, surely the organization is worth supporting."

IS THE ASSOCIATION NECESSARY?

It might be said that the times had changed, and that the need of an

Association specially devoted to the interests of gas companies, as distinct from gas undertakings, was not necessary. Well, he thought every member present at this meeting would disagree with that view—[Hear, hear]; and he believed they would disagree for this reason: The industry was, for good or ill, divided up into suppliers of municipal gas and suppliers of company gas. As he had been a company man all his life, and full of the advantages of company gas, while one could not set back the clock, he believed if one had the problem to solve to-day that was solved by their predecessors forty or fifty years ago, in more than one respect the course of things would be different. But it was easy to be wise after the event. The particular responsibility of the Association arose from the fact that it was the custodian and the guardian of the united interests of shareholders in gas undertakings. With all his knowledge of and respect for management by municipal authorities, and their ideas of how industry could be carried on, as distinct from the carrying-on of industry by the limited liability system, he could not help thinking that, during the past seven years, knowledge of what might happen as the result of dissociating industry from limited liability companies had greatly extended, and people in this country were wiser in these matters than they were in 1914. This being so, he did not think there could be any doubt that, as long as a considerable proportion of the gas supply in this country remained in the hands of limited liability companies, so long would it be necessary to have an Association particularly devoted to watching over their interests; and this, he thought they might pride themselves, their Association would do with great completeness and satisfaction. He supposed that they all watched best what touched their pockets most. However conscientious a gas committee of a corporation might be, he could not imagine, so long as human nature was what it was, they would look on problems in quite the same way as those who had financial interest in them such as had the board of directors of a company. He did not wish to suggest that the work done by corporation committees was not done (he might say) admirably; but he could not bring himself to believe that any body of men were so likely to watch over the affairs of others in the same way they would do over their own. This was really the position with regard to the difference between company holding and municipal holding. There were many matters, of course, in which the industry as a whole should speak with a united voice; but he did not think that for a single moment this should interfere with companies raising their voices on behalf of their shareholders in respect of special matters which they considered important. And he was not sure that in the future they would gain less respect from, or that they would be listened to less seriously by, the authorities by reason of the fact that their Association represented a large body of shareholders in contradistinction to representing, if one might speak of it as an equivalent, a large body of ratepayers. He thought the change in their outlook that had arisen in the last seven years was not on the whole discreditable to the conduct of industry by limited liability companies. They had tried a great many things; and he thought the dispassionate observer would agree that those who had cried out largely against the capitalist system in the past would be much inclined to moderate their views to-day. Those who read of labour as it was voiced in the public Press—as far as they could judge from what was published of the utterances made in a calm and dispassionate manner by leaders of labour to-day—would be inclined to think with him that labour was changing its attitude. He believed among labour leaders—not the ultra ones, but the moderate minded ones—there was growing-up the belief that capital might not after all be such a bad thing. And one might conceive of a state of affairs where there would be a swinging-back of the pendulum to the belief that the carrying-on of industry by capital was not necessarily inconsistent with their ideas of a Utopian state. If this was so, they must be prepared for what might come about; and so they should maintain intact the Association, constituted as it was. They not only wanted to do this, but they would speak with greater force the more constituents they had, and the more they could represent in capital value. Therefore it was important that gas undertakings as a whole should look dispassionately, if he might say so, on their record, and ask themselves whether, for the very moderate subscription as set out in the constitution, the Association did not provide an insurance which was likely to come back to them in value over and over again. He thought they should remember the industry could not thrive by itself, as distinct from many other businesses which could be carried on without regard to others. What was harmful in detail to the gas industry was harmful, sooner or later, in a more or less degree to the industry all over the country. And similarly if the industry in distant parts of the country thrived, similar undertakings in other parts were, directly or indirectly, receiving benefit therefrom. It seemed unfortunate that he should be there that day having to plead in the same way that his predecessor was pleading a year ago for the support of the industry. It almost made him (Dr. Carpenter) despair when he saw how year after year Mr. Jones, in presiding over these meetings, made similar appeals, because no one could read these reports and financial statements, and be satisfied with the disclosures; they did not show at all a happy state of things as regards finance. It seemed unfortunate that year after year Mr. Jones had been obliged, as he (Dr. Carpenter) had been that day, to ask that greater support should be given to the Association.

WORK OF THE COMMITTEES.

In more than one other respect, he (the Chairman) would be treading on Mr. Jones's heels and in his footsteps. He had often referred to the work done by the Committees of the Association. Last year he mentioned especially the Income-Tax Committee. This Committee had impressed him (the Chairman) very much with their earnestness and the work they had been able to do, and the results they had been able to effect, in that most important matter of their relationship with the revenue authorities. He supposed there was one other subject he ought not to pass over. That was with reference to the Committee's action in respect of the Gas Regulation Act, and the Committees on inerts and carbon monoxide. He did not think he could say more with regard to this, except to assure the members—if it were necessary, and he did not think it was (as he believed they knew it as well as he did)—that the help given by the Association was exceedingly valuable in bringing about the result set forth in the respective reports of the two Departmental Committees, as well as in the General Act.

WORK OF THE DIRECTOR OF GAS ADMINISTRATION.

On behalf of the members, he also wished to express from the chair their great satisfaction with the admirable manner in which the Director of Gas Administration had so far carried out his very arduous and very difficult task. He thought it was probable they would have said, had they been asked in the earliest stages of this business, that it would have been impossible for anyone to have got through such an enormous amount of work as had been entailed by the drastic change that had come about in the position of nearly every important gas undertaking in the country. This had been done through the earnestness with which the Director had applied himself to the task. He (Dr. Carpenter) was sure the members would not like this occasion to pass without recording the satisfaction with which they regarded the labours of the Director of Gas Administration. ["Hear, hear."]

A CENTRE FOR HELP.

Then it had been said that the Association provided a focus, or a centre, to which every member of the Association could apply for help; and he was sure the members must have been struck, as he had been, by the paragraph in the report as to the various matters that had been raised between one or other of the members and the Secretary. He was afraid that this was an aspect of their operations that was overlooked. The members of the Association had the right to consult one of the most experienced Parliamentary Agents in gas matters in Westminster. The firm with which Mr. Cooper was connected had been associated with the parliamentary business of gas undertakings for a great many years. Here they had the very centre of a knowledge of what was going on, and what affected them, in Parliament; and instead of having to rely upon local advice and understanding, the members of the Association were in touch here with the very last word. Some decision might have been given in Westminster yesterday. A letter touching this matter might be received by their Secretary the next morning, and a reply giving the latest information would be received in a day or so. This was a very great privilege; and that they might expect this would be more valued in the future than it had been in the past was indicated by the increase in the number of those who took advantage of what was provided. He should like to add his tribute to the personal attention Mr. Cooper gave in these matters. It would be obvious that in the last twelve months, owing to the position in which the members were kind enough to place him (Dr. Carpenter) a year ago, he had had many opportunities of gauging the extent of the work of their Secretary; and he had invariably found that, when any matter of importance had arisen on the parliamentary horizon, Mr. Cooper had had first and direct knowledge of the fact, and at once discussed whether or not there was occasion to call a meeting of the Committee. He thought the members of the Association were to be congratulated on being associated with a man like Mr. Cooper, who had the ability, and would take the trouble, to set members right on matters in which they could not help themselves.

A REPRESENTATIVE COMMITTEE.

He (the Chairman) thought he had dealt with the more important matters in the report. He would, however, in conclusion emphasize the opportunity the Association gave in bringing together in a practical committee a number of gentlemen who were deeply interested in matters appertaining to the politics of gas companies—thus giving them the opportunity of discussing the various problems that arose from time to time. And as these gentlemen were closely associated with undertakings not only in one part of the country, but in different parts, and with both large and small concerns, the experience they brought to bear on the work of the Committee was exceedingly weighty. He should like to assure the members of his belief that the result of their labours was extremely valuable to the gas industry at large. Personally, he had only time to devote to the work of the industry if, in the long-run, it might be of some use or other to the Company or companies with which he was associated. This was really the beginning and the end of it; and he said this because it emphasized—or he hoped it did—what he had said about this point, that they could not dissociate one part of the industry from another. He knew perfectly well that the time he had to give to the affairs of the Association was ultimately going to benefit the South Metropolitan Gas Company, because it benefited the industry throughout the country. If all would only look on the matter in this broad way, and feel that the time devoted to the affairs of the Association would be beneficial, if not immediately, later on, then they would not grudge their small subscription in return for these advantages to which he had referred.

THE CHAIRMAN AND THE DEPARTMENTAL COMMITTEES.

The VICE-CHAIRMAN (Mr. R. W. Edwards, of Aldershot), in seconding the motion, said, if he might be allowed to say so, there was one serious omission in the Chairman's speech, but an omission for which he would be forgiven. The Chairman had made no reference to himself. He had spoken most unselfishly about what was done with regard to the inquiries respecting carbon monoxide and inerts; but it was scarcely to be expected that he would amplify his remarks by mentioning the fact that he was the prime mover in the matter so far as the Association was concerned. The amount of trouble, the care, the thoroughness, and thoughtfulness the Chairman exercised on this occasion, both in the Committee room and outside, would be a lasting record of the services he had rendered in the first year of his chairmanship. It would not be Dr. Carpenter's wish that he (Mr. Edwards) should dwell too much on this. No one could have been more thorough, or more conscientious, or exacting, than their Chairman, both in regard to the preparation of the evidence, and the form in which it was subsequently submitted to the Committees.

THE ALLOWANCE FOR DEPRECIATION.

Mr. E. J. K. FUSSELL said he could endorse all the Chairman had said in regard to the Income-Tax Sub-Committee. No doubt they had been very helpful, particularly to small companies. He should like to ask whether any members of the Association were having any

difficulty in sustaining their claims for the increased rate of depreciation on meters, stoves, and gasholders granted during the war.

The CHAIRMAN remarked that the matter was still under consideration by the Income-Tax Committee. It was a question of policy that required somewhat careful handling. If it would satisfy Mr. Fussell, he would rather not say anything more on the point at present. The matter had not been overlooked; but it was still in hand for consideration and discussion in the appropriate quarter.

The motion was carried unanimously.

PRESIDENT AND VICE-PRESIDENTS.

The CHAIRMAN proposed the re-election of Sir J. Fortescue Flannery, Bart., M.P., as President and Mr. H. E. Jones and Mr. Charles Hunt as Vice-Presidents. He met Sir Fortescue Flannery on the Board of the South Suburban Gas Company; and in speaking with him about this meeting, he voluntarily said that the Association had done very good work in connection with the Bill for reconstituting the gas industry on its new basis. This was peculiarly gratifying, as Sir Fortescue Flannery was behind the parliamentary scenes; and it was an unsolicited testimonial to the Association. With regard to Mr. Jones and Mr. Hunt, he could not add anything. Their vocabulary was exhausted when they wanted to do complete justice to these gentlemen. Their old friend and advocate of the gas industry, Mr. Harry Jones, was one of the best of friends, and one of the soundest gas engineers and gas administrators of his and their own times. They were very pleased indeed to be able to look forward to the continuance in office of these two gentlemen as Vice-Presidents.

Mr. T. H. HAZELL (Newport, Mon.) seconded the motion, which was very cordially agreed to.

Mr. JONES, in returning thanks on behalf of the President, Mr. Hunt, and himself, said he should like to say a few words about the utility of the Association, and about its practical weight and dynamic force, in resisting what its founder, Sir George Livesey, was always working at—that was, the attempts to cripple and fetter the industry. There could not be the slightest doubt that the Association was a very effective force indeed in the inquiries which had recently been held, and which were vital to the future existence of the industry. In connection with these inquiries, they had the advantage of having in their chair a gentleman who could lead, guide, and represent them. There was no man in England to-day—whether he was an expert, great or small—who could have put the gas case, and the necessity of preserving the liberties of the industry, with the force and effect that Dr. Carpenter had brought to bear. He (Mr. Jones) had a very old and attached friend—Sir Dugald Clerk—and he knew of the inestimable value that Sir Dugald's evidence was to the industry—as well as his reports and researches upon the question of whether high or low grade gas was essentially necessary for such a purpose as power. Sir Dugald's science was on a very high level; but his science, high as it was, was in no respect above the science which their own Chairman had brought to bear, and so effectively, in the witness chair before the Board of Trade Committees. This was because Dr. Carpenter had extraordinary attainments in chemical research and knowledge, and he also had (if he might be allowed to say so) a very convincing method, although a quiet one, and a very lucid manner of making elaborate chemical problems very simple to the lay mind. The Committees were not altogether composed of lay minds. They had upon them chemists, but the great weight of Dr. Carpenter's evidence lay in the fact that not only was he a chemist, but he had been all his life making gas, and that on a large scale. He could therefore tell the Committee what was the point of view of the consumers, and so was able effectively to urge that the Committee should not fetter the industry with unnecessary restrictions. He had read with great care and attention the evidence given by their Chairman, and also his old friend Mr. Goulden, who, like their Chairman, could bring (if not the same high chemical knowledge) some 45 years' experience in gas manufacture to bear upon the question. With these two gentlemen, and with the assistance of other experts, whose opinions he valued very much, they were able to convince the Committee that what the industry wanted was the liberty to let the man who consumed gas have it on the lowest possible terms. If they wanted cheap gas, they must not put upon it all sorts of restrictions. If their Association was to be put on trial at any time as to what it had done, the fact of the Chairman's service in this matter could be put forward as justification for its existence, which, together with Mr. Cooper's experience, was one of the greatest factors in preserving the liberty of, and in conferring new liberty upon, the industry. The evidence and the experience carried the Committees to a distinct expression of opinion that the industry should have the freedom for which they appealed. He also referred to the lack of enthusiasm, especially among the smaller companies, regarding membership of the Association; and he regretted that through this the Secretary did not get better remuneration for the considerable services he rendered to the members. He (Mr. Jones) thought that each existing member ought personally to try to get more members, so that they would have the funds from which to reward their Secretary on a better scale. He sincerely hoped their efforts would result in some improvement in this respect. He knew that the question had been raised as to whether the Secretary of the Association ought to be a Parliamentary Agent. Personally, he (Mr. Jones) was convinced, from the very nature of the work the Secretary performed, that he should be so. The first Secretary, who was almost the founder of the Association, was a Parliamentary Agent. He bore the honoured name of Livesey, and was a member of the firm of Baxter, Ross, Norton, & Co., Parliamentary Agents. In conclusion, he said he was glad that the affairs of the Association were now in the hands of such a capable Chairman as Dr. Carpenter; and he should like to add that, had it not been for the Carpenter burner, the calorific value of their gas to-day would have been quite a different thing from what it was.

RE-ELECTION OF MEMBERS OF THE COMMITTEE.

The CHAIRMAN proposed the re-election of the retiring members of the Committee whose names are given in the Committee's annual report.

Mr. C. F. BOTLEY (Hastings), in seconding, said he should like to say two things as he had now the opportunity. In view of some controversy which transpired in connection with the matter of the evidence which should be given before the Committees, and which the Chairman submitted on behalf of the Association, it was told him by a competent gentleman that he considered Dr. Carpenter's evidence was the most convincing of any that was given, and, so far as he (Mr. Botley) was able to judge, it was so. The Chairman had mentioned that the Association united men from all parts of the country. One of the great pleasures the members of the Committee had, besides transacting business which was an advantage to their individual companies, was the great privilege of meeting friends from all parts, as well as the great benefit of becoming acquainted with gentlemen like their Chairman, and their friends Mr. Jones, Mr. Charles Hunt, and many others—gentlemen whom it would not be their privilege to know as intimately, and to their great advantage, without they had these meetings.

The motion was carried unanimously.

RE-ELECTION OF AUDITOR—THE QUESTION OF UNEMPLOYMENT.

On the proposition of the CHAIRMAN, seconded by Mr. JONES, the Honorary Auditor (Mr. W. A. Scott, F.C.A.) was re-elected.

Mr. SCOTT, in acknowledging his re-election, referred to the excellent manner in which Mr. Cooper provided his accounts for examination. He also asked to be allowed to allude to a question which had arisen of late, and to inquire whether the Association were taking any steps to back-up that which had already been done in relation to the question of unemployment. It occurred to him when the matter became a burning one that, if the Government, instead of giving doles to men for doing nothing, and granting money to local authorities to enable them to provide unproductive work for the sole purpose of giving the unemployed a living wage, would encourage gas and electricity concerns by guaranteeing the capital or interest necessary for works extensions—particularly in the case of the smaller companies—they would be doing a far better national work. He referred to what was being done by the electricity industry in the matter, and proceeded to remark that since the outbreak of war small gas undertakings had not been able to obtain the necessary capital for desirable extensions. There were a great number of companies in the kingdom who were willing and wishful to extend their mains and operations into neighbouring parts if they could find the capital; and this would be the means of supplying employment to many men, and at the same time give an impetus to the industry and to the prosperity of the country generally. What had been done by the electrical people, was reflected in the Bill now before Parliament—the Trading Facilities Bill—by which 25 millions was being set aside to enable the Government to guarantee the capital expenditure of companies, corporations, and other bodies or persons, who were willing to lay-out the capital. But this must be for the express object of finding employment for the unemployed. He should therefore like to know whether the Association were taking any steps to bring this matter before the members, particularly those associated with the smaller companies, so that they might have an early opportunity of taking advantage of that which was about to become legislation. This was really a very important question, because the smaller companies were so differently situated from those represented by some of the gentlemen present at this meeting. They could obtain capital, while the smaller companies were simply unable to find a pennypiece for the purpose.

The CHAIRMAN replied that the Association had sent out to all the members a circular letter marked "Urgent," in which they drew attention to the Trades Facilities Bill, especially in its relationship to the difficulties that the smaller companies were in, regarding the extension of their business and the appropriateness or otherwise of linking-up, in order, as desired by the authorities, to provide work for the unemployed. The Committee had received a batch of replies: but, having only just been received, they had not yet been examined. Until this had been done, they could not possibly decide whether or not there was a good case to put before the authorities. The case would naturally have to be based upon the extent and the nature of the replies they received. However, the Committee would, as quickly as possible, give very careful attention to the matter.

VOTES OF THANKS TO THE SECRETARY.

The CHAIRMAN (proceeding) said he should like to express publicly how much the members of the Association appreciated the services of their Secretary, Mr. Cooper. He had already told them how much the Association were indebted to him; and Mr. Jones had made the confession, and one with which he (the Chairman) cordially agreed, that Mr. Cooper was not getting for his service to them adequate remuneration. This was one of the matters they must correct. But whatever they did with regard to this, they could not separate without expressing to him their deep and full appreciation of the admirable services he rendered as their Secretary.

Mr. SCOTT seconded; and the motion was cordially agreed to.

Mr. COOPER said he was extremely indebted to the Chairman and to Mr. Jones for the kind way in which they had referred to his efforts on behalf of the members, and to the members for their very kind acceptance of the vote of thanks proposed by the Chairman. Hitherto, he had taken the greatest interest in the work of the Association; and he should continue to do so with the hope of increasing success.

VOTES OF THANKS TO THE CHAIRMAN.

Mr. HAZELL proposed, and Mr. D. H. HELPS seconded, a very hearty vote of thanks to the Chairman for presiding.

The motion was carried unanimously.

The CHAIRMAN thanked the members for their cordial vote of thanks. He added that he had been fortunate in receiving very gratifying expressions of the confidence of the members that afternoon; and he should go away with a renewed belief that he could do something in the interests of the Association.

At the annual meeting of the Evesham Town Council last Wednesday, Alderman Fisher alluded to a loss on the half-year's trading, due to the high cost of coal, and intimated that there was no immediate intention to make any alteration in the price of gas. The Committee thought it would be better to wait and see the result of the whole year's working.

METER INSPECTION IN EDINBURGH.

The report of Mr. William Gordon, Official Inspector of Gas-Meters for the City of Edinburgh, for the year ended May 15 last, states that the number of gas-meters tested and examined during the twelve months was 73,144—3648 wet and 69,496 dry meters; and fees to the amount of £2767 were collected. There was a profit on the year's work of £114.

The total number of meters tested by the Department since its institution in 1861, up to and including May 15 last, is 3,200,503; the fees received for the same period being £93,873. By the amalgamation of Edinburgh and Leith, two additional gas-meter testing-stations were brought under the jurisdiction of the Edinburgh Local Authority. On Jan. 1 a new and increased scale of fees to be charged for the verification of gas-meters was sanctioned by the Board of Trade; and on March 1 the Gas-Meter Regulations, 1920, made by the Board under the Gas Regulation Act 1920, came into force. The new regulations and schedule of instructions are of great value to inspectors; and uniformity in the methods of testing gas-meters should now be obtained throughout Great Britain.

Tables accompanying the report contain the following figures:

——	Stamped.	Rejected as Incorrect.	Per Cent.
Total dry meters tested. .	69,496	1,197	1·72
Total wet meters tested. .	3,648	20	0·54
	73,144	1,217	—

SAFEGUARDING OF INDUSTRIES ACT, 1921.

Complaints under Section 1, Sub-Section (5).

The Board of Trade give notice that they have received a formal notice of complaint under the above sub-section from Messrs. Smiles & Co., Solicitors, of No. 15, Bedford Row, W.C., on behalf of the Incandescent Mantle Manufacturers' Association, that incandescent gas-mantles have been improperly excluded from the lists of articles chargeable with duty under Part I. of the Act. The Referee will hear this complaint on Saturday, Dec. 3, at 10 a.m., at the offices of the Board in Great George Street; and any persons directly interested in the matter should communicate immediately with the complainants or with the Board, as they may desire.

The Board have also had notice of complaint that calcium carbide has been improperly excluded. The hearing in this case will take place on Dec. 10.

NEW GAS PLANT FOR BARRY.

The Barry (Glam.) Gas Committee on Tuesday of last week sanctioned the provision of new plant for their works costing £125,000.

The Chairman (Mr. C. B. Griffiths, O.B.E.) stated that the existing plant was installed eighteen years ago. The daily gas consumption had since doubled, and was now over a million c.ft.; but so far as the carbonizing plant and gas storage capacity were concerned, the undertaking was in the same position as it was with a much smaller consumption in 1914. As the storage capacity was only 500,000 c.ft., it was necessary to fill the holder twice in twenty-four hours. The vertical retorts which were to replace the existing inclined retorts would give a considerably larger production of gas per ton of coal; the saving in this respect being 25 p.ct. It would be necessary to rebuild the existing retort-beds, which would probably mean an expenditure of £1600 per bed.

Mr. T. E. Franklin (the Gas and Water Engineer) said the cost of installing the tank, holder, and vertical retorts would be approximately £125,000. In the existing storage plant some of the plates were in such a condition as to give rise to serious alarm.

The Committee decided in favour of the work of erecting the new retorts being proceeded with immediately, and that application for grants be made to the Ministry of Health and the Unemployment Grants Committee.

NEW SPIRAL GASHOLDER AT ORMSKIRK.

Inauguration Ceremony.

There was a large gathering on Monday of last week at the works of the Ormskirk and District Gas and Electricity Company, to witness the turning-on of gas from a new holder. The holder, which has been erected by Messrs. S. Cutler and Sons, Ltd., is of a capacity of 500,000 c.ft., with a steel tank containing 1¾ million gallons of water. The ceremony of turning-on the gas was performed by Mrs. R. R. Glover (wife of the Chairman of the Company), who was presented by Mr. E. E. Linaker (Vice-Chairman), on behalf of the Directors and shareholders, with a massive silver rosebowl, suitably inscribed, as a memento of the occasion. There was afterwards an inspection of the works.

Replying to a vote of thanks to his wife, Mr. Glover congratulated Messrs. Cutler and Sons upon the successful completion of the holder, and also the Consulting Engineer (Mr. Isaac Carr) and the Gas Engineer and Manager (Mr. W. M. Carr) upon their share in the work. Some years ago, the Directors found the works much out of date; but under the able guidance of Mr. Isaac Carr, they had come through their troubles. In their present Engineer and Manager, they had a man of ability, who threw his whole heart and soul into the work. The Directors purchased the holder from the Government Disposal Board—it having been built by Messrs. Cutler and Sons for the purpose of being transported to Ireland to be used for the filling of airships during the war. Fortunately, however, the war ended, and the holder came on to the market. He could only say that the shareholders had got a bargain.

Mr. Isaac Carr thanked them for the kind words said about what service he had been able to render to the Company. It was often said that the best test of engineering was time. It was now nearly ten years since he was called upon to advise the Directors that the works required reconstructing. They were face to face with various problems; but he was in the pleasant position that day of being able to say that, had he to advise them again now, he would follow precisely on the same lines as previously. He thought the works were now in a position to compete with any other undertaking in the kingdom.

Acknowledgment was also made by Mr. W. M. Carr, who remarked that when he first went to Ormskirk in 1911, the sales of gas amounted to 43 million c.ft. per annum; while this year the sales would be 86 million c.ft., or exactly double. They were a public supply Company, and were out to give the very best service they could. They had spared no pains, and had laid down almost a complete new plant, the only old building left being the purifier-house, which would soon be replaced by new purifiers, after which there would be no part of the old works standing. The present works would be equal to sales amounting to 130 million c.ft. per annum. Their plant throughout was of a most modern character; and they could use any class of coal, as they did during the strike.

AN INSTITUTION OF CHEMICAL ENGINEERS.

Decision to Form a New Body.

At a dinner and meeting at the Engineers' Club, London, last Wednesday, Sir Arthur Duckham presided over a company of about 75; and it was decided to go ahead with a scheme for the formation of an Institution of Chemical Engineers. Those present consisted largely of members of the chemical engineering group of the Society of Chemical Industry; and they came from all over the country, including Glasgow, Manchester, Huddersfield, Birmingham, Liverpool, and Sheffield. In addition to the support given by those present, Prof. J. W. Hinckley, who was primarily responsible for calling the meeting, and was also the prime mover in the formation of the Chemical Engineering Group, of which he was the first Chairman, had received from those unable to attend a very considerable number of letters offering to support the proposed Institution. Among those who were present were Mr. W. J. N. Woolcock, M.P. (General Manager, British Chemical Manufacturers' Association), Mr. W. T. Dunn (Secretary, Institution of Gas Engineers), Dr. E. W. Smith, Mr. J. A. Reavell (Chairman, Chemical Engineering Group), Mr. H. Talbot (Hon. Sec., Chemical Engineering Group), and Dr. R. Lessing.

SIR ARTHUR DUCKHAM, in opening the meeting, referred to the necessity for developing chemical engineering in this country as a means of holding our own in the chemical industry generally. The situation here to-day was different from what it was ten years ago, and the line of future progress was in the direction of the chemical engineer rather than the engineer or the chemist. One of the most important things which the proposed new Institution would have to do was to create a real chemical engineer, for at present he had never met one in this country. The proper training for chemical engineers was one of the strongest arguments in favour of the new body; and the only point against taking such a step was that it meant another institution. Most of them were sick of societies and institutions. They loathed being dragged out at all times to meetings and conferences. At the same time, he felt that by forming a new institution of chemical engineers they would perhaps do something to hasten the amalgamation of all engineering institutions into one central organization, which would hold one meeting a year, and leave the different branches to work in sections during the year. Therefore, with only this one objection to the proposal, he was entirely in favour of it.

Prof. J. W. HINCKLEY said the large number of letters he had received in favour of the proposal left him in no doubt as to the need for the Institution, or that this was the right time to form it. Indeed, he had been pressed to go ahead, and had been told that if something was not done in London, action would be taken in Manchester. Notwithstanding the great progress that had been made in all branches of engineering during recent years, we were only just beginning to see the possibilities of chemical engineering. There were many instances of the vast improvement that had been made in works where sound chemical engineering principles had been applied. Chemical works had been enabled to increase their output three or four times, while the time taken in performing operations had been reduced in a like proportion. Germany's pre-eminence was not due to the fact that she had better chemists; it was because she had looked after the business of developing chemical engineering. In America, degrees were granted in the universities for chemical engineering; but if such a thing were mentioned here, one received black looks from the engineers on the Senates of our universities. A chemical engineer was not merely a chemist and not merely an engineer. Even if a man were a good chemist and a good engineer, it did not follow that he was a chemical engineer. The bulk of the problems which the chemical engineer had to deal with did not come within the study of the ordinary engineer. As industry developed, certain classes of chemical engineers were created, such as gas engineers, who made a study of a special branch; and the great difficulty was that the schools were not sending out the right type of man. If such branches of industry wanted a first-class man, they had to make him. Therefore it was necessary to develop a new class of man, who turned his attention to special branches of industry. This involved a training in carrying out chemical reactions on a large scale and a study of the changes of the physical state of substances. It was a mistake to suppose that by collaboration between an engineer and a chemist, one would get chemical engineering work done. If it were, it would only be at too great expense. Therefore, the only possible way to develop the chemical industry was to develop an entirely new class of man—the chemical engineer. He would be a man who would not be a substitute for the chemist on the one hand and the engineer on the other. The only point raised in all the letters he had received was whether they should start a new Institution because of the many

existing ones. None of them, however, catered for the chemical engineer; and his own opinion was that an Institution of Chemical Engineers would stimulate the activities of the other bodies. The Society of Chemical Industry and the others did not undertake to qualify anybody as a chemical engineer; but the first and most important function of the new body would be to take in hand the training of chemical engineers.

Mr. W. J. N. WOOLCOCK, M.P., said it had always been difficult to know what a chemical engineer was; and from this and other points of view it was perfectly obvious that it was desirable to form an Institution of Chemical Engineers. Personally, he did not think it would clash with any of the existing bodies, not even the Chemical Plant Manufacturers Association. America was already 13 years ahead of us in this matter. He therefore proposed "That the formation of an Institution of Chemical Engineers is desirable."

This motion was seconded and carried unanimously, as were the two following resolutions:

"That a Provisional Institution be hereby formed."

"That a Provisional Committee of indefinite number, with power to co-opt, be elected at this meeting."

The only criticism, if it can be called such, came from Captain J. C. Goodwin, who pointed out that the American Institution of Chemical Engineers intended to change its name to the Institution of Chemical Engineers. There would then be two Institutions with the same name, and he suggested that it would be better if there could be one institution for all the English-speaking countries. The total membership of the American Institution was 450; and he imagined that for some time at any rate, the membership of the new body in this country would not exceed 150. Therefore it would be better to have one Institution for all the English-speaking races, because South Africa, Canada, and other countries would no doubt follow on similar lines. Perhaps the matter could be taken-up with the American Institution. Incidentally, Captain Goodwin mentioned that recently he went over a German works where acetone was being made in a very similar manner to the way it was done at Shawinigan in Canada; but he was delighted to find that the Shawinigan plant was turning out the same quantity as the German plant, but was only one quarter the size. Yet Canada was not properly organized as regards chemical engineering and was gradually drifting towards the United States with regard to the qualification of her chemical engineers. For these reasons he hoped some effort would be made to see if the new Institution here could join forces in some way with the American Institution.

Prof. HINCKLEY said there had already been communications with the American Institution and co-operation had been promised. The matter would be gone into in greater detail by the Committee when it was formed.

Ultimately, the following Provisional Committee was appointed: Sir Arthur Duckham, Messrs. W. J. N. Woolcock, M.P., F. H. Rogers, F. A. Greene, D. Brownlie, J. A. Reavell, W. Macnab, H. Talbot, and J. MacGregor.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 14.

In the London tar products market there is nothing of particular interest to report. In the absence of inquiry, pitch is rather weaker; the price being called from 55s. to 57s. 6d. per ton net f.o.b. makers' works. Creosote is steady at about 8d. per gallon, net and naked. Pure benzole and pure toluole stand at about 3s. 6d. per gallon, 95-160 solvent naphtha at from 3s. 3d. to 3s. 6d. per gallon, and pyridine bases at about 5s. 6d. per gallon.

Tar Products in the Provinces.

Nov. 14.

There has been a heavy fall in the price of pitch and creosote during the past week; but beyond these two articles other bye-products remain fairly firm.

The average values for gas-works products during last week were: Gas-works coal tar, 42s. 6d. to 47s. 6d. Pitch, East Coast, 45s. to 47s.; West Coast—Manchester, 40s. to 45s.; Liverpool, 40s. to 45s.; Clyde, 40s. to 45s. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 6½d. to 7d.; salty, 6½d. to 6⅝d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £15 to £20; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

The market is still very dull and, one might also say, unsatisfactory. Pitch is only in small demand for the Continent; and next year's outlook is very uncertain. Although there is likely to be a fairly heavy demand for road repairing purposes, there is some question about production, which may be affected by the condition of the coke-oven industry. Meanwhile, there is a fairly general impression that prices will fall. Already one hears of sales at 45s. per ton; and it is not easy to find buyers for forward deliveries. On the other hand, a large contract for delivery for next year has been made by a South Wales consumer at 50s. per ton delivered. The price nominally is 50s. to 52s. 6d. Solvent naphtha is not changed; and although transactions are being done at less, 3s. is the nominal price. Naphthalenes are unchanged. Crudes range from £5 to £8 per ton, and the firelighter industry is showing a little more activity in this section. Refined naphthalene is about £16 to £18 per ton. Cresylic acid is steady at

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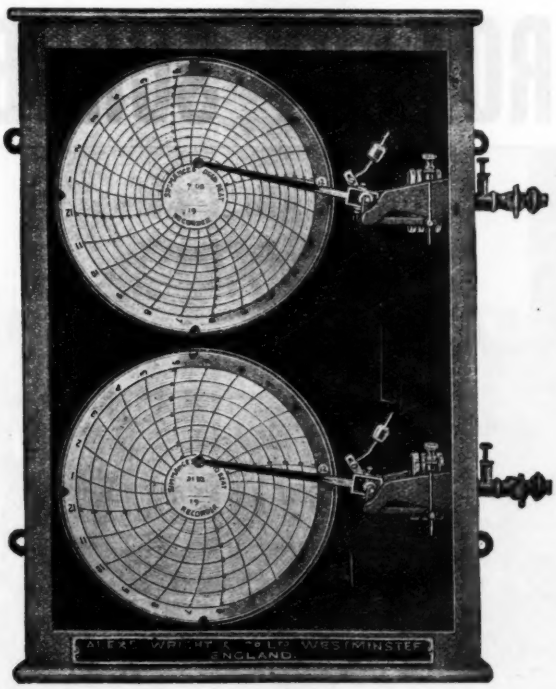

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2s. 6d. or just under; but carbolic acid is as dull as ever at 1s. 6d. per gallon for crude 60's and 4½d. per lb. for crystals. Benzoles are scarce, but without change in price. Intermediate products have been quiet since my last report; but the market is becoming much more interesting than for some time past. Aniline oil and salts were well inquired for, and are on the scarce side at 1s. 7d. and 1s 8d. per lb. respectively. Salicylic acid is very firm at 1s. 4d. per lb. for technical grade. Resorcin continues a steady market at 5s. 6d. per lb. Beta naphthol remains at 2s. 6d. per lb.

Sulphate of Ammonia.

For home use the demand for this material has been comparatively small. On the other hand, there has been very fair inquiry for export. During last month, 11,558 tons, valued at £157,074, were exported. This compares with 10,309 tons, valued at £368,740, in the same month last year. It is interesting to note that the Dutch East Indies again stood first in their demands last month, the quantity exported having been 4441 tons. Trade with France has also been substantial; not less than 4377 tons having gone there. The market in France is a quiet one; French production has been absorbed, and all demands are now being met with imported material, the chief seller of which is Great Britain. It is probable that supplies of sulphate of ammonia in France during the coming spring may be very scarce; and we may look for continued expansion in business with that country. In America, prices are rising; but consumers are now keeping down their demands so as not to force prices up artificially. Even now, however, the United States is probably the cheapest producer of this material.

Testing-Station Holders.—The recommendation of the Public Control Committee that the tender of Messrs. Parkinson and W. & B. Cowan, Ltd., for test-holders and fittings, be accepted, as recorded on p. 450 of last week's "JOURNAL," was adopted by the London County Council without debate.

A Price Agreement at York.—The Joint Committee of the Finance and Watch Committees of the York City Council report that they have had under their further consideration the question of the York Gas Company's application to the Board of Trade for an Order authorizing the Company to charge per therm for gas, instead of per 1000 c.ft., and fixing the price at 1s. 4d. per therm. They engaged the services of Mr. Arthur Valon, of London; and after considering the suggestions made by Mr. Valon, and hearing the views of the representatives of the Company, they decided to agree not to oppose the application of the Company if the Company would agree to the price being fixed at 1s. 1d. per therm, and to pay dividends for 1921 and 1922 not exceeding £4 4s. p.ct. (being the pre-war dividend), and for 1923 not exceeding £4 10s. p.ct. The Committee have now been informed that the Company agree to these proposals. The Committee have accordingly taken steps to have the agreement ratified.

Coke in Small Quantities at Manchester.—The arrangements made last winter by the Manchester Gas Committee for distributing coke in small quantities at a reduced price, were resumed last week. The coke will be sold at the Gaythorn, Rochdale Road, and Bradford Road gas-works at 1s. 3d. per cwt. measure, and 7½d. per ½-cwt. measure, which is equivalent to 25s. per ton. Coke will also be distributed at the various Corporation yards at 1½d. per shovelful of about 10 lbs.

Gas at Less than Cost at Hartlepool.—The West Hartlepool Corporation have been seeking a reduction in the price of gas. At last Thursday's meeting of the Corporation, however, a letter was read from the Hartlepool Gas and Water Company, stating that from January to April the price was less than cost; and, in face of heavy losses, it would be impossible for them to recommend the Board to reduce the charge for gas for some little time. The letter reminded the Council that the Company were paying £5000 or £6000 more in rates than before the war.

Waterford Gas Company.—Mr. J. H. Sugrue, presiding at the annual meeting of the City of Waterford Gas Company, alluded to the difficulties which had been encountered in regard to coal supply, and said they found it necessary to get only one cargo from the Continent, which was both excessively costly and of inferior quality. Expenses all round had been very heavy, but the profit stood at £3103, as against £2819 in the previous year. They could now only pay the statutory dividend of 3¾ p.ct. because of the high price of gas, which, in turn, was due to the high cost of material and labour; but they were making an application under the Gas Regulation Act which they hoped would enable them to pay higher dividends. The Corporation had complained of the price of gas, and the matter went to arbitration, with the result that they were able to confirm their figures, and the Corporation then settled the balance in dispute. The water-gas plant erected two years ago had proved very valuable, especially during the coal strike. On the Company's appeal, the valuation of the works for rating had been reduced. The report was adopted, and the dividend declared.

A verdict of "Death due to coal-gas poisoning, self-administered," was returned at an inquest at Cleckheaton in the case of George B. Hartley, a chartered accountant and well-known business man, who was found dead on a couch in his office, covered with a blanket, under which was a rubber tube attached to a turned-on gas-bracket.

The profit of Messrs. Head Wrightson and Co. for the year ended April 30 last amounted to £63,033 (against £78,917), to which is added £19 643 brought forward. The following amounts have been appropriated: Debenture interest, £6750; preference dividend, £9302; Directors' fees, £1000; reserve, £30,000; and interim ordinary dividend, £10,500; leaving £25,124. A final dividend at the rate of 2½ p.ct. on the ordinary shares is declared, making 7½ p.ct., less tax, for the year; and £19,028 is carried forward. The total dividend for the previous year was 10 p.ct.

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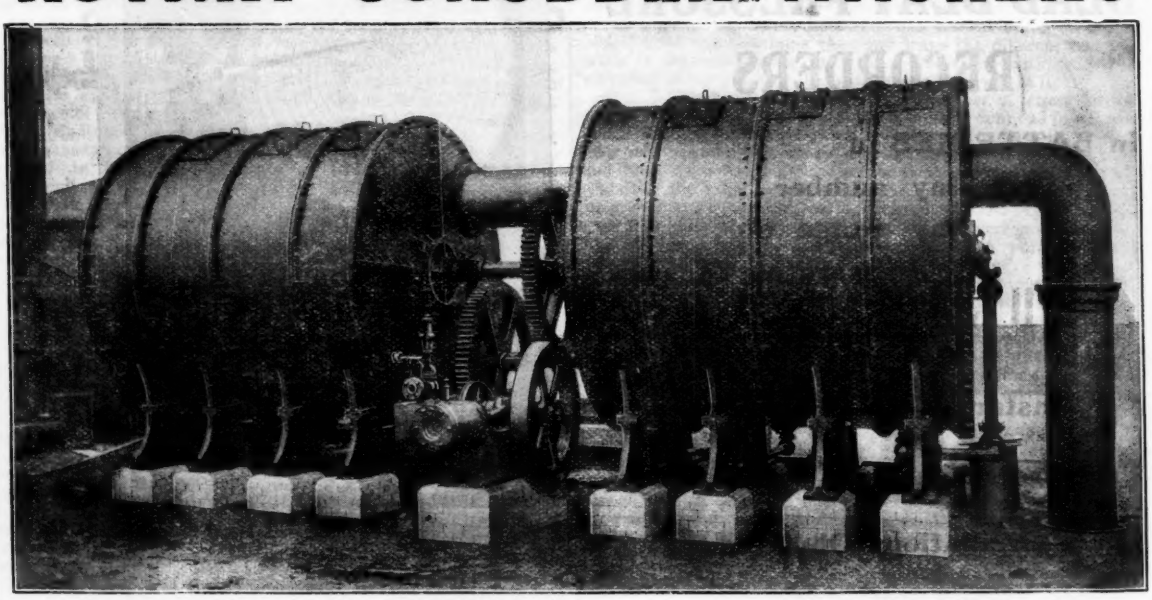

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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 9.]

Nos. 28,809 to 29,542.

ALDRIDGE, J. G. W.—"Charging-machines for inclined gas-retorts." No. 29,018.
ASHLEY, T. J.—See Aldridge. No. 29,018.
BICKNELL, R. H.—"Pipe-joints." No. 29,275.
BRINSLEY, F.—"Bringing about water absorption of ammonia gas." No. 29,456.
BRION, A.—"Apparatus for carburetting air with naphthalene." No. 29,424.
DAVIDSON, W. B.—"Manufacturer of producer gas." No. 28,925.
DIXON, S. M.—"Manufacture of steel and concrete pipes." No. 29,547.
DORSEY, A. S.—"Valve mechanism for water-heaters." No. 29,307.
EDWARDS, G. T.—"Self-closing valves." No. 29,370.
HARTLEY, H.—"Atmospheric gas-burners." No. 28,906.
HOVEY, D. W.—"Method of obtaining light hydrocarbon distillates from heavier hydrocarbons." No. 28,900.
HUDSPETH, G. L.—"Low-temperature carbonizing plant." No. 28,839.
KEMPTON, C. H. A., AND KEMPTON & CO., LTD., C. H.—"Burners and burner fittings." No. 29,427.
LAWRANCE, H.—"Gas-stoves." No. 29,526.
LEES, W.—"Machines for breaking coke." No. 28,818.
MACNICOLL, D.—"Self-operating stop-valves." No. 29,100.
MACTAGGART, A. M.—See Dixon. No. 29,457.
MAINWARING, H. T, W.—"Gas-turbines." No. 28,886.
MUSCHAMP, P.—"Apparatus for indicating and measuring quantity of air, water, steam, &c., passing through pipes." No. 29,410.
NYBORG, T. G.—"Gas-lighters, &c." No. 28,873.
RADIATION, LTD.—"Atmospheric gas-burners." No. 28,906.
RICHARDS, W. J.—See Hudspeth. No. 28,839.
SHAW, H. S. HELE-.—"Leak-tight joints for pipes, &c." No. 28,924.
SHORE, B.—See Lees. No. 28,818.
SMEATON, J. R.—"Stoves or heating and/or lighting devices." No. 29,471.
SMITH, E. W., AND SMITH METERS, LTD.—"Stuffing-boxes for gas-meters." No. 29,302.
STETTINER CHAMOTTE-FABRIK AKT.-GES. VORM DIDIER.—"Gas-heated ovens and retorts." No. 29,420.
STROUD, H. C.—See Hudspeth. No. 28,839.
THOM, F. S., AND R. W.—"Retort for distillation of carbonaceous matter." No. 29,086.
THOMPSON, A.—See Hudspeth. No. 28,839.
TRIBE, E.—See Shaw. No. 28,924.
UMPLEBY, F.—"Gas-light fittings." No. 28,932.
VICTORY PIPE JOINT COMPANY, LTD.—See Shaw. No. 28,924.
WILLIAMS, H. L.—See Dixon. No. 29,457.
WITTMEIR, R. S.—"Gas-engines." No. 29,040.
YATES, H. JAMES.—See Radiation. No. 28,906.

An Irish Gas Consumers' Association.—A Gas Consumers' Protection Association which has been formed in Dublin proposes, according to an intimation made by the Hon. Secretary, to extend the scope of its activities throughout all the urban centres in Ireland.

Proposed Extensions at Croston.—There was a special meeting of the Croston Urban District Council last week, at which Mr. W. L. Heald, of the Preston Gas Company, gave advice regarding the proposed extension at the local gas-works—the putting-down of a new bed of six retorts and the provision of another gasholder—as the result of which the daily output of gas would be increased from 24,000 to 30,000 c.ft. He stated that, for the size of the works, Croston was the cheapest authority for a considerable area around Preston.

Electric Inspection Box Explosion at Blackfriars.—A considerable portion of the City was without electric light or power for about three hours last Sunday afternoon, as the result of the fusing of one of the cables serving the western part of the City of London Electric Lighting Company's area of supply. Soon after two o'clock, an explosion took place; and the large metal-bound stone cover of an electric cable inspection box, in the pavement of Blackfriars Bridge, was thrown up. Parts of the surrounding pavement were also torn up; but fortunately there were few people on the bridge at the moment, and nobody was hurt.

Croydon Gas Company's Powers.—There was an extraordinary general meeting last Friday afternoon of shareholders in the Croydon Gas Company, for the purpose of approving an application to the Board of Trade for a Special Order under section 10 of the Gas Regulation Act. The Company are by the Order seeking powers to raise additional capital. The Directors have for a long time past contemplated the conversion and simplification of the different existing classes of capital; and advantage is being taken of the application to the Board of Trade to effect this, and also to bring the regulations governing the Company into conformity with modern practice.

London County Council and Gas Charges.—At the meeting of the London County Council on Tuesday of last week, Mr. J. D. Gilbert, M.P., asked the Chairman of the Public Control Committee whether the South Metropolitan Gas Company should not make a reduction to South London consumers similar to that announced by the Gas Light and Coke Company, and why these two Companies now charged different prices for the supply of gas in South London. Sir George Piggott (the Chairman of the Committee) replied that the charge of 11½d. per therm made by the South Metropolitan Company was substantially less than the reduced charge announced by the Gas Light and Coke Company. If the South Metropolitan Company reduced their charge to less than 11d., they could increase their dividends under the sliding-scale. According to the Company's recent announcement, however, they were not in a position at present to make a reduction.

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A list of new companies registered in Scotland includes the Wick Gas Company, Ltd. This is a private concern, with a capital of £15,000, formed to take over the undertaking of the Wick and Pulteneytown Gas Light Company.

In his report on the Hull Corporation accounts, the Auditor stated that the net revenue of the Gas Department (after charging interest, loan instalment, and income-tax amounting to £3509), shows a surplus for the year of £1054, as against a surplus of £808 last year.

The Directors of the Monte Video Gas and Dry Dock Company, Ltd., have declared an interim dividend on the ordinary stock for the half year ended June 30 of 2 p.ct. (actual), free of income-tax, payable on Dec. 1. This compares with 3 p.ct., free of tax, for the corresponding period of 1920; the reduction being mainly due to the fall in exchange of remittances to London, and losses resulting from the coal strike.

The memorial (a cenotaph) to the men of the Birmingham Gas Department who lost their lives in the war, will be unveiled on Saturday next at the Council House. Tablets, on which the names of the men are inscribed, will also be placed in the five works of the department.

Mr. T. P. Ridley, the Secretary of the Newcastle and Gateshead Gas Company, who has been elected President of the North-East Coast Association of Chartered Secretaries, delivered an interesting Inaugural Address at the annual meeting of the Association. He pointed out that the great problem facing the nation is how to improve trade. To this end, the high cost of production must be lowered—first by a ruthless cutting-down of national and municipal expenditure; and, secondly, taxation must be reduced. The first item to disappear should be the corporation tax; and there should be a reduction of income-tax. Greater effort in personal service is required of all men; and economy in private life, as well as in the public services, is essential.

STOCK MARKET REPORT.

THE general tone of things on the Stock Exchange last week made further improvement; but it was not free from fluctuations. The gilt-edged market scored advances. In Home Government issues, all the big four but War Loan closed higher; Friday's figures being: Consols 48½-49¼, War Loan 87⅝-88, Funding 72⅜-72¾, Victory 78¾-79¼. Bonds were in less demand. Indians were lower. Home Rails had a good rise, but came in for some profit-snatching at the close. Canadian were irregular; but Argentine had a good week.

The Foreign Market was dull for awhile, but amended later; Argentine, Chinese, and Brazilian being conspicuous.

The Miscellaneous Market improved on brighter trade prospects. Rubber was in much better form, and Oil was stronger in spite of some profit-snatching. Textiles did not advance.

Business in the Gas Market was about of equal proportions to the week before in point of volume; but the greater share of it was in Gas Light and Coke, which showed remarkable strength, opening at 57¼ and closing at 64, with a rise of 6½ in the quotation. South Metropolitan followed suit, opening at 67 and closing at 70½, with a quotation rise of 3. The Suburban and Provincial group were inconspicuous. In the Continentals, Imperial had a few transactions at about a point lower than the previous week; but the debenture rose 1. Primitiva had but one single bargain in the preference.

Bargains done for cash during the week were as follows: On Monday, Bournemouth "B" 8⅞, ditto debenture 57½, 58, Brentford "B" 64½, British 23½, European 6⅜, Gas Light ordinary 57½, 57⅜, 58, 58½, 58¼, 59, 59½, 60, 60½, 61, ditto 10 p.ct. bonds 134, Hornsey 103, Imperial Continental 136½, 137, Sheffield "C" 61¾, South Metropolitan 67, 67⅜, 68½, ditto 6½ p.ct. debenture 101½-102. On Tuesday, Brentford "A" 69, 69½, Brighton and Hove original 117, British 23⅜, Continental Union 18, Gas Light ordinary 61, 61½ 61⅞, 62, 62½, ditto maximum 44½, Imperial Continental 136, 137½, ditto debenture 82⅜, 83, 83¼, South Metropolitan 68, 68½, 69, 69½, Wandsworth new 57½, Bournemouth 7 p.ct. debenture 101⅜, Exeter 10 p.ct. ordinary 130½, Harrow and Stanmore 5 p.ct. 60, 60½. On Wednesday, Bournemouth "B" 8 15/16, 9, Brentford "A" 68½, 69, 69½, ditto "B" 64½, 65, Buenos Aires 40, European 6½, Gas Light ordinary 61½, 61⅝, 61¾, 62, 62½, ditto maximum 44⅜, 45, 45¼, Hornsey 101½, 102, Imperial Continental 135, 136, South Metropolitan 69, ditto 6½ p.ct. debenture 101½-102½, Bournemouth 7 p.ct. debenture 101½. On Thursday, Bournemouth debenture 57½, 57⅜, Brentford "A" 69½, ditto "B" 64½, 64¼, Commercial 3½ p.ct. 50, Gas Light ordinary 61½, 61⅝, 61¾, 62, 62½, 63, ditto maximum 45¼, Imperial Continental 136½, Oriental 85, South Metropolitan 69, 69½, ditto debenture 49¼, ditto 6½ p.ct. debenture 101½-102½, Bournemouth 7 p.ct. debenture 102. On Friday, Alliance and Dublin 49½, Brentford "A" 69, 69½, 69½, Commercial 3½ p.ct. 51½, European 6½, Gas Light ordinary 62½, 63, 63½, 63⅜, 64, ditto debenture 51½, Imperial Continental 135, 136½, Monte Video 55, Primitiva preference 38s., River Plate 43, South Metropolitan 69⅜, 70, 70½, ditto 6½ p.ct. debenture 103, Cardiff 5 p.ct. ordinary 69⅜, Metropolitan of Melbourne shares 6⅜, Tynemouth 65.

In the Money Market, an increased demand at once manifested itself and hardened from day to day; but on Friday it began to relax. Discount was very firm. Silver cheapened to 38½d. The Bank rate is 5 p.ct., as fixed on Nov. 3.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.e.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.e. Pref.	...	50—55	...
1,551,868	,,	Oct. 13	2½	3⅛%	Alliance & Dublin Ord.	59—64	48—51	49½
574,000	,,	July 14	4	4%	Do. 4 p.e. Deb.	76—79	46—51	...
280,000	5	Aug. 11	7½	4/—	Bombay, Ltd.	5⅛—6⅛	3—3⅜	...
100,000	5	,,	16	4/7½	Bourne- mouth Gas and Water { 5 p.e. B 7 p.e. Pref. 6 p.c. 4 p.c. Deb.	... 15—15½ 13½—14 ...	7⅜—8⅛ 8⅛—9 7⅜—8⅛ 54—59	... 8⅛—9 57⅛—58
383,110	10	,,	7	7/—				
115,000	10	,,	6	6/—				
162,065	—	June 30	—	4%				
992,045	Stk.	July 15	14	56/—	Brentford A Consolid.	261—266	68—71	68⅛—69½
734,920	,,	,,	11	55/—	Do. B New	204—209	64—67	64½—65
55,000	,,	,,	5	5%	Do. 5 p.e. Pref.	109—111	68—72	...
221,400	,,	June 15	4	4%	Do. 4 p.e. Deb.	91—95	57—59	...
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig.	208—215	115—120	117
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	82—87	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 29	12½	10%	British	44—45	22—24	23½—23⅝
120,000	Stk.	June 30	4	4%	Do. 4 p.e. Deb. Stk.	88—90	55—58	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	42—45	40
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.e. Pref.	4—6	4½—5¾*	...
100,000	Stk.	June 30	4½	4½%	Do. 4½ p.e. Deb. Stk.	70—75	53—58	...
157,130	,,	Feb. 26	5	5%	Chester 5 p.e. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.e. Stk.	106—108	54—57	...
560,000	,,	,,	5¾	38/4	Do. 3½ p.e. do.	103—105	50—53	50—51½
475,000	,,	June 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	44—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	18—20	18
200,000	,,	,,	7	—	Do. 7 p.e. Pref.	115—118	30—35	...
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.e.	...	150—155	...
278,400	—	,,	12	12%	Croydon B and C 7 p.e.	...	120—125	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6½—7½	6½—6⅞
16,298,975	Stk	Aug. 11	1/17/4	46/8	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds.	92—102	62—65	57⅞—64
2,600,000	,,	,,	3½	35/—		76—79	44—46	44⅜—45⅛
4,062,235	,,	,,	4	4%		96—99	59—61	...
4,674,850	,,	June 15	3	3%		72½—74½	50—52	51½
130,000	,,	Dec. 11	10	10%		...	...	134
82,500	,,	Sept. 14	5	3⅛%	Hastings & St. L. 5 p.c.	...	48—50	...
258,740	,,	,,	3½	2⅛%	Do. 3½ p.c.	87—89	34—36	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5—6	...
86,600	Stk.	Aug. 26	9	9⅛%	Hornsey 7 p.e.	...	100—105	101½—103
131,000	,,	July 28	7½	7½%	Ilford A and C	151—154	80—82	...
65,780	,,	,,	6½	5⅛%	Do. B	115—118	57—59	...
65,500	,,	June 30	4	4%	Do. 4 p.e. Deb.	92—94	54—56	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	150—160	135—140*	135—137½
1,235,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	82—84	82½—83½
235,242	,,	Mar. 30	6½	3⅛%	Lea Bridge Ord. 5 p.e.	119—121	71—73	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.e. Ord. { A. B.	211—213 146—148	... ...	... ...
506,085	,,	June 26	4	4%	Do. 4 p.e. Pr. Deb. Stk.	...	...	...
165,746	,,	Aug. 11	7/5/6	6%	Maidstone 5 p.e.	...	54—56	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb.	...	40—43	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	1¾—2¼	...
250,000	100	Oct. 3	4½	4½%	Met. of Melbourne 4½ p.e. Deb.	99—101	88—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	55—60	55
1,875,892	,,	July 28	4½	3%	Newcastle & Gatsh'd Con.	98½—99½	58—60	...
529,705	,,	June 30	3½	3½%	Do. 3½ p.e. Deb.	82—83	50—52	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/0	5/3	Do. 7 p.c.	14—15	7¼—8¼	...
500,000	Stk.	May 12	8	8%	Oriental, Ltd.	117—122	88—93	85
60,000	5	Mar. 26	10	1/—	Ottoman, Ltd.	7½—7⅝	2—3	...
188,120	Stk.	June 30	—	3⅛%	Plym'th & Stoneh'se 5 p.c.	...	64—67	...
60,000	30	Aug. 26	13	60/—	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/—	Do. C	118—121	51—54	...
249,980	5	April 29	8	—	Primitiva Ord.	5⅜—6	⅛—¼	...
499,960	5	June 26	5	—	Do. 5 p.e. Pref.	4⅜—5	1½—2	38/—
521,800	100	June 1	4	4%	Do. 4 p.e. Deb.	91—93	65—67	...
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1911	...	42—45	...
346,198	,,	June 30	4	4%	River Plate 4 p.e. Deb.	85—87	42—45	43
150,000	10	Sept. 29	6	6/—	San Paulo { 6 p.e. Pref. 5 p.e. Deb.	10½—11	6—6½	...
125,000	50	June 30	5	5%		47—49	35—38	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	225—234	61—62	...
209,984	,,	,,	10	5%	Do. B	222—224	62—64	...
523,500	,,	,,	10	4½%	Do. C	220—222	61—63	61½
135,801	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.e.	...	...	...
90,000	10	Oct. 28	9	8%	South African	10½—11½	7—9*	...
6,609,895	Stk.	July 28	5/4/0	5%	South Met. Ord.	111—115	69—72	67—70½
250,000	,,	July 14	—	5%	Do. Red. Pref.	...	93—95	...
1,895,445	,,	,,	5	5%	Do. 5 p.e. Deb.	73½—74½	48—50	49½
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	157—159	88—90	...
1,087,795	,,	Aug. 11	6	5⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	68—70	...
368,837	,,	June 30	5	5%	Do. 5 p.e. Deb. Stk.	116—118	73—76	...
647,740	,,	May 12	7½	3⅜%	Southampton Ord.	99—102	55—58	...
121,275	,,	June 30	4	4%	Do. 4 p.e. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 11	—	6%	Tottenham { A 5 p.e. B 3½ p.e. 4 p.e. Deb.	135—138	63—65	...
782,275	,,	,,	6	4½%		115—117	53—55	...
181,255	,,	June 15	4	4%	District	87—89	54—57	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.e. Deb. Red.	93—95	45—50	...
256,476	Stk.	Aug. 26	5	3⅛%	Tynemouth 5 p.e. max.	108½—109	64—66	65
30,000	,,	Aug. 11	8½	66/3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.e.	151—156	78—80	...
253,636	,,	,,	6½	51/3	Do. B 3½ p.e.	129—134	59—61	...
108,075	,,	,,	—	46/4½	Do. C	...	55—57	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	57½
352,000	,,	,,	6½	45/—	Wimbledon 5 p.e.	117—122	53—55	...
98,000	,,	,,	6½	50/—	Epsom 5 p.c.	121—126	50—58	...
88,416	,,	June 30	5	5%	5 p.e. Deb. Stk.	66—69	44—47	...

* Ex Div.